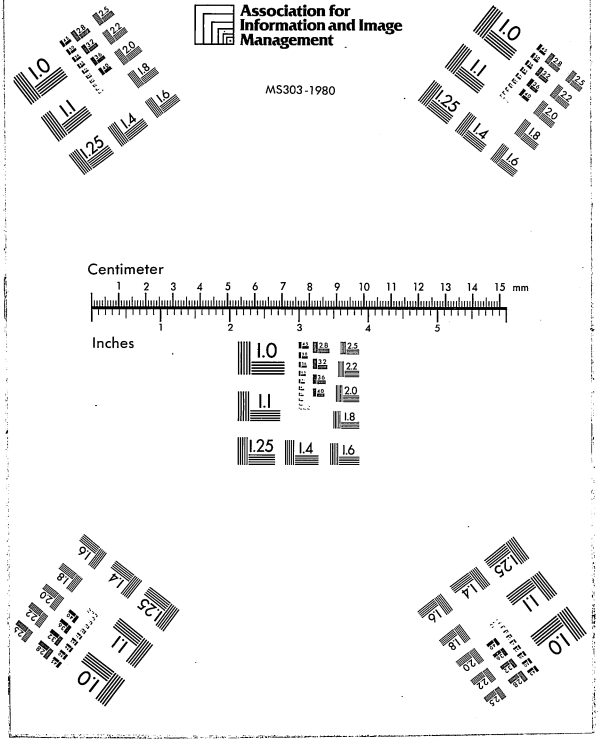
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1.6
1.8
2.0
2.2
2.5
2.8

Thomas A. Edison Papers

A SELECTIVE MICROFILM EDITION

PART II
(1879–1886)

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START

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THOMAS A. EDISON PAPERS

A SELECTIVE MICROFILM EDITION
PART II
(1879–1886)

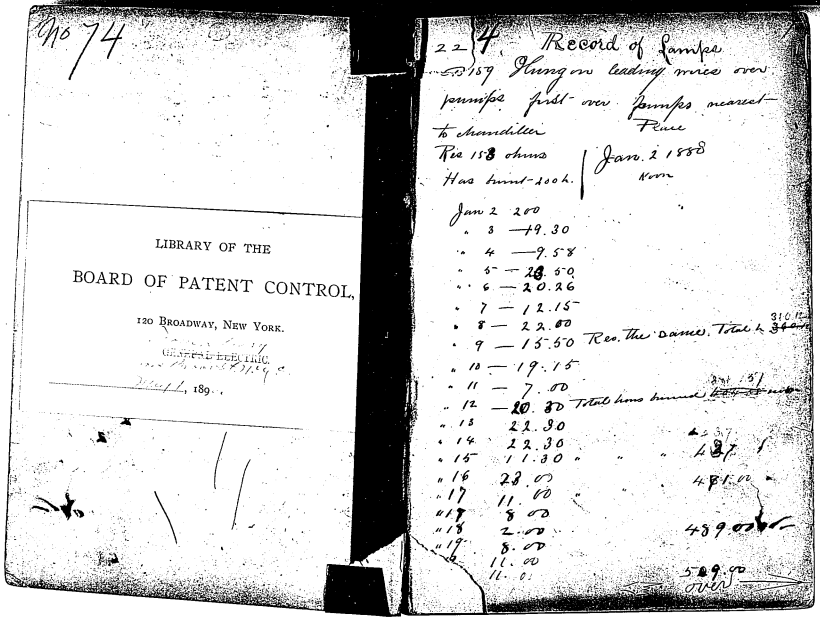
REEL 35

NOTEBOOK SERIES (NBK–13)

Menlo Park Notebooks, #74 – #89

Menlo Park Notebook #74 [N-80-01-02.3]

This notebook covers the period January-March 1880. It was used, probably by Albert Herrick, to keep a record of lamps burning at the Menlo Park laboratory complex. An index to the lamps appears at the end of the book. The label on the front cover is marked "Record of Lamps." The book contains 284 numbered pages.


No 74
LIBRARY OF THE
BOARD OF PATENT CONTROL,
120 BROADWAY, NEW YORK.
GRAPHITE ELECTRIC CO.
, 189 .
22 4 Record of Samples
5589 Hungen leading wires over
pumps first over pumps nearest
to chandelier
Res 158 ohms
Has burnt-100 h.
Jan. 2 1888
Nom
Jan 2 200
" 3 — 19.30
" 4 — 9.58
" 5 — 18.50
" 6 — 20.26
" 7 — 12.15
" 8 — 22.80
" 9 — 15.50 Res. the same. Total h
" 10 — 19.15
" 11 — 7.00
" 12 — 20.80 Total hours burned
" 13 22.30
" 14 22.30
" 15 11.30 " " "
" 16 23.00
" 17 11.60 " "
" 18 8.00
" 19 2.00
" 19 8.00
11.00
11.00
OVER

Jan 20 Up to 5-09

20	11. 00	
21	9. 15	
22	15. 45	
23	8. 00	Total 553.10
24	5 00	
25	18 30	
26	6. 00	
27	10. 00 "	592.40
28	10. 40	Total Grs. 20
29	11 00	64. 20
30	10. 25	Gross 20
31	11. 00	685. 45
Feb 1	10. 00	
2	11. 00	656. 45
3	11. 00	
4	16 00	
	27. 00	

Bucket at 8 o'clock

Total hours 683. 45

228 Third chandelier up room 8
in laboratory

Res 140

Burnt 18 hours | Jan 2 1880 Flour room

Jan 3	32. 60	
4	9. 58	
5	23. 47	
6	20. 26	
7	12. 15	
8	22. 80	
9	15. 50	Total time burned 178.12
10	19. 13	
11	7 00 "	" 217. 17 room
12	20. 00 "	
13	22. 30 "	" 237. 47 "
14	22. 30	
15	11. 30 "	" 271. 17 "
16	11. 00 "	
17	22. 00	
18	11. 00 "	" 339. 17 "
18	18	
18	2	
19	8 00 "	" 367. 17 Total time

One clamp red-hot poor trimming

Buster at

158 Over Carmans desk Office

Rec. 126 chains | June 2/1880

Burnt 50 hours | Noon Page 81

June 2	60.00	
" 3	69.58	
4	29.50	
5	23.47	
6	20.26	
7	12.15	
8	22.06	
9	15.58	Total time burned 170.12
10	19.15	
11	7.00	" " 217.17
12	20.00	
13	22.30	" " 207.47
14	22.30	
15	11.30	" " 299.47
15	11.00	
16	22.00	
17	18.00	" " 382.17
17	8.00	
18	2.00	
19	19.00	" 372.17
20	11.00	
20	11.00	
21	9.15	
22	15.45	
23	8.00	" " 416.17
25	5.00	
25	14.30	
26	6.00	
26	10.30	" " 450.17
27	10.30	
	11.00	" " 471.57

Jan. 27	10.25	
" 28	11. 00	Total 5-38.14 noon
28	10. 00	
29	11. 00	Total 5-38.14 "
30	11. 00	"
31	11. 00	"

Buried at Clamps on Pro. 1

5-6.2.14

201 Over Barnards deck (office) 57

Rec. 147

Burnt 60 tons Jan 2. 1880. Place 80

Jan. 3	19.30	noon
" 4	9.5-8	
" 5	23.47	
6	20.26	
7	12.15	
8	22.00	
9	15-50	
10	19.15	
11	22.00	
12	20.00	
13	22.30	
14	22.50	
15	11.30	Total hours Burned 822.18 noon
16	11.00	
17	11.00	" " 3/210 "
17	8.00	
18	2.00	
19	19.00	
20	11.00	" " 412.13 "
20	11.00	
21	9.00	
22	15.45	
23	8.00	" " 456.18
23	2.00	
24	19.30	
25	6.00	
26	10.32	" " 496.13 "
26	10.30	
27	11.00	" noon 517.33

16

27	10.00	
28	11.00	38.14 noon
29	22.00	
30	22.00	
31	22.00	
February 1	6.00	
" 2	19.00	Total 619.14
" 3	11.00	619 hours
" 3	10.00	
" 4	19.00	" 638. "

Burnt 50 hours

March 7

164 Office Chamberlain Mess 6.11

door

Rec 132 | Jan 21 1850 Plane 28

noon

Burnt 50 hours

Jan 3	17.30	
4	9.50	
5	22.00	
6	20.26	
7	12.15	
8	22.00	
9	15.00	
10	19.15	
11	7.00	
12	20.00	
13	22.30	
14	22.30	
15	11.30	home burnt 322.13 noon
15	22.00	
16	22.00	" " 367.13 "
17	11.00	
17	8.00	
18	22.00	
19	19.00	
20	11.00	" 418.13 "
20	11.00	
21	9.15	
22	15.45	
23	8.00	" " 462.13 "
23	5.00	
24	18.30	
25	6.00	
26	10.30	
26	10.40	" " 501 "
27	11.00	" 523.48
27	10.25	504

Jan	28.	11.00	Total [illegible]
	28	10. 00	
	29	11. 00	538.14 "
	29	11. 00	
	30	22. 00	
	31	22. 00	
Feb.	1	6. 00	
"	2	19. 00	680 14m
"	2	9. 00	
"	3	11. 00	
"	3	10. 00	
"	4	9. 00	640.14 mm

172 Chandelier over Griffs Desk 7/13

Res 135

Burnt 50 / Jan 2 1880

Jan.	3	19.30
	4	9. 58
	5	23.45
	6	20.26
	7	12.15
	8	22. 00
	9	15. 50
	10	19.15
	11	7 00
	12	20. 00
	13	22. 30
	14	22 30
	15	11. 30 Total hours burned 322.13 mm
	15	11. 00
	16	22 00
	17	11. 00 " 367. 13 "
	17	8. 00
	18	2. 00
	19	19. 00
	20	11. 00 " 408 13 "
	20	11. 00
	21	9. 15
	22	15.45
	23	8. 00 " 462.13 "
	24	5 00
	24	14. 30
	25	6. 00
	26	10. 30 " 502 .13 "
	26	10. 40
	27	11. 00 " 628.43
	27	10.25

14

Jan	28	11.00	5~~6~~8.65
	28	10.00	
	29	11. 00	528.15
	29	11.00	
	30	22. 00	
	31	22. 00	
Feb	1	6. 00	
"	2	9. 00	610.15 hours
"	2	9. 00	619 "
"	3	10. 00	
"	4	9. 00	" 698.15 "

Taken to Edison Palace

15-8 Chandelier to office room 8 P

New Circuit

Rec. 137. June 2 1880

Burnt 50 hours

June 3	19.30	
4	9 58	
5	23.47	
6	20.26	
7	12.15	
8	22 00	
9	15; 50	
10	19.15	
11	7.00	
12	20.00	
13	22.30	
14	22.30	
15	11.30	Total hours burned 322.13 hours
15	11.00	
16	22.00	
17	11.00	" " " 367.13 "
17	~~8~~ 00	
18	2.00	
19	19.00	
20	11.00	" " " 407.13 "
20	11.00	
21	9.15	
22	13.45	
23	6.00	" " " 457.13 "
23	3.00	
24	18.30	
25	6.00	
26	10.30	" " " 491.13
26	10.40	
27	11.00	" " " 512.12
27	11.25	
28	10.00	" one " " 523.37 "

19 June 28 11.00
29 11. " Total 5388.17 "
30 11.00
31 22.00
Feb 1 22.00
2 6.00
3 11.00 " 610.17
4 9.00 619.17 "
5 10.00 "
6 9.00 " 638.17 room

Busted Carbon after burning 1020 hours

Inside of globe discoloured

270 Hand lamps at Regulator table 9 7/
bottom room

Rec 140

Burnt 75

June 2 1880 Flame 82 room

June	3	19.30
	4	9.58
	5	23.47
	6	20.26
	7	12.15
	8	22.00
	9	15.30
	10	19.15
	11	7.00
	12	20.00
	13	22.80
	14	22.30
	15	21.30 Total hours burned 247 13 room
	15	11.00
	16	22.00
	17	11.00 " " " 391.13 "
	17	8.00
	18	2.00
	19	19.00
	20	11.00 " " " 431.13 "
	20	19.00
	21	9.15
	22	15.45
	23	8.00 " " " 475.13 "
	23	5.00
	24	18.30
	25	6.00
	26	10.30 " " " 515.13 " over

18

Jan.	26	10.40	
	27	11.00	
	27	10.25	5-37.5-3 hours
	28	10.40	1559 23
	28	10 00	
	29	11.00	5-30.23
	29	11.00	
	30	22.00	
	31	22.00	
Feb	1	6.00	
	2	19.00	6.40.23
	2	11.20	
	3	11.00	6 62.23
	3	11.00	
	4	11.00	684.28

Burned

Dec 1880 7 Burned total 1806 hours

42 Mrs Jordans Dining-room 10 19

Rec 160

Burnt 35-hours | Jan. 2/1880 Pewe 38 room

Jan	3	19.50
	4	9.5-5
	5	13.47
	6	20.26
	7	12.15-
	8	22.00
	9	15-50
	10	19.15-
	11	7.00
	12	20.00
	13	22.30
	14	22.30
	15	11.30
	16	11.00
	17	22.00
	18	22.00 " " " 3671.13
	19	19.00
	20	11:00 391.18
	20	11.00
	21	9.15-
	22	15.45-
	23	8.00 " " " 483.5.18
	23	5.00
	24	18.30
	25-	6.00
	26	10.20 " " 475.18
	26	10.40
	27	11.00 " " 496.45
	27	10.25-
	28	11.00 over " 618.08

Total hours burned 3071.13

20 Jan. 24 10.00
27 11.00 5-39.68
29 11.00
30 22.00
31 22.00
Feb 1 6.00
2 9.00 tot 609.08 "
2 9.00 615.00
3 10.00
4 9.00 637.00 "

108 Fleet Camp at Cabana Site
Place 3
Rec 141
Burnt 85 hours | Jan 2 1880
from one 8 oil dumps.

Jan 2.	85 hours	
" 3	19.30	
4	9.58	
5	23.47	
6	20.26	
7	12.15	
8	22.00	
9	15.50	
10	19.15	
11	7.00	
12	20.00	
13	22.30	
14	22.30	
15	11.30	Total hours burned 307.13
15	11.00	
16	22.00	" " " 381.13
17	11.00	" " "
17	8.00	
18	2.00	
19	19.00	
20	11.00	" " " 401.13
20	11.00	
21	9.35	
22	15.45	
23	8.00	" " " 445.13

Burnell at 4.00 PM
Not stranded - Rec 7. mer over

thought-

thought cross Forker on Jan. 23 when Deputy went to fix it found safety catch cross broken at cross relight- and broke at portion 7. in a few minutes

Jacket-Lamp at cross Upton's home

Rec. 182

Jan. 2 1880 noon

Burnt- 90 hours B.

Jan 3	19.80	
4	9.55	
5	23.47	
6	20.26	
7	12.15	
8	22.60	
9	15.50	
10	19.15	
11	7.60	
12	20.60	
13	22.30	
14	22.30	
15	11.60	Total hours burned 362.15 noon
15	11.00	
16	22.60	" " 406.13 "
17	11.15	
17	8.00	
18	2.00	
19	9.00	
20	11.00	" " 446.15 "
21	11.00	
22	17.15	
23	13.45	
23	8.40	" " 490.15

found end not given to me

Space to me afterward custom house cross Chemp. J.

224 Aptera Palon middle

Place 24

Rec. 107

Burnt 40 hrs

June 2. 1880

June 2 — 3 30

3 3 30

4 3 30

5 3 30 True hrs 154.30

6 3 30

7 3 30

8 3 30 Carbon rotten off at

9 3 30 with clamps

10 3 30

11 3 30

12 3 30

13 3 30

14 3 30

15 3 30 Folded hours 68-00 rain

15 3 30

16 3 30

17 3 30 " " 74.00 "

17 3.30

18 3.30

19 3 30 " " 80300 "

20 3. 30

21 3 30

22 3 30

23 3 30 " 193.30 "

24 3 30

25 3 30

26 3 30

Burned at 3 hrs 5 50 J. Evans Jr.

carbon broke off at 6 hrs 30 clamps from place

29 3 30 " 181.00

" 3 30 " 36.30 "

170 Systems pulled corner by door

Rec. 157

Burnt 40 hours

June 2 1880

noon place 25

June 2	3 30	
3	3 30	
4	3 30	
5	3 30	
6	3 30	
7	3 30	
8	3 30	
9	3 30	
10	3 30	
11	3 30	
12	3 30	
13	3 30	
14	3 30	
15	3 30	Total hours burned 220 hours
16		" " 96.00
17	3 30	" "
18	3 30	
19	3 30	
20	3 30	" " 183.00
21	3 30	
22	3 30	
23	3 30	" " 113.30
24	3 30	
25	3 30	
26	3 30	" " 128.30
27	3 30	" " 128.30
28	3 30	
29	3 30	" " 130.00
30	3 30	" " 134.30
31	3 30	

28

Feb. 1 3.30 ✓
2 3.30 Total 148.30
3 3.00
4 3.30 " 154.00

29

Oct 8

Options pasture for corner
Rec. 147 cows 3.0 } Jour. 2. to 8 Pages 28
Bought 40 hens } Jour. 2. to 8

Jour. 2	3.30	
3	3.30	
4	3.30	
5	3.30	
6	3.30	
7	3.30	
8	3.30	At Jarvis — calculated for Hazelhurst Agricultural
9	3.30	
10	3.30	
11	3.30	
12	3.30	
13	3.30	
14	3.30	
15	3.30	
16	3.30	Total hens turned [illegible]
17	3.30	" " " 74.00
18	3.30	
19	3.30	
20	3.30	" " " 165.00
21	3.30	
22	3.30	
23	3.30	" " " 124.30
24	3.30	
25	3.30	" " " 123.30
26	3.30	
27	3.30	" " " 139.30
28	3.30	
29	3.30	" " " 131.00
30	3.30	134.30
31	3.30	

30

Feb 1	8.30	
2	8.30	Total 148.30 K.
3	2.00	
54	3.00	" 198.30

181 Jn Septimo mille ✓ 31

Rec 152

Burnt 40 hmm / Dunn 2/1880 place 26

noon 2=

Jan 3	19.30	
4	9.58	
5	28.47	
6	20.26	
7	12.15	
8	22.00	
9	15.00	
10	19.15	
11	7.00	
12	20.00	
13	22.30	
14	22.30	
15	11.30	Total hours burnt 259.01 noon
16	11.00	
18	23.00	" " " 304.01 "
17	11.00	
17	8.00	
18	2.00	
19	19.00	
20	11.30	" " " 344.01 "
21	9.15	
22	15.45	
23	18.00	
24	18.30	
25	6.00	
26	16.50	" " " 421.31 noon
29	10.00	
27	11.40	" " " 432
28		over Burnt

32

Burned at the Swamp

33

197 Jos shandelier over door
in Office with side light Hand side
Rec. 145-

Jan. 3 1880 Rec 129

Jan. 3	12 80	
4	9.58	
5	23.47	
6	20.26	
7	12.15	
8	22.00	
9	15.00	
10	19.15	
11	7.00	
12	20.00	
13	22.30	
14	22.31	
15	11.30	Total time burned 219.01
15	11 00	
16	23.00	
17	11.00 " " "	264.01
17	8 02	
18	2.00	
19	19.00	
20	11.00 " " "	304.03
20	11.00	
21	9.15	
22	15.45	
23	8.00 " " "	348.01
23	5.00	
24	18.80	
25	6.00	
26	10.30 " " "	388.07
26	10 40 " " "	398.47
27		408

Top room (Experiment room)

307. 2 chamber piano organ with side
242 Reeds.

Commenced Tuning Jan. 5 1880 Place 63 room

Jan 3	72		
	4	9.50	
	5	13.40	
	6	20.25	
	7	12.15	
	8	22.00	
"	9	15.50	
	10	19.15	
	11	7.00	
	12	20.00	
	13	22.30	
	14	22.30	
	15	11.30	Total time Carried 219.01 room.
	15	11.30	
	16	23.00	
	17	11.00	" " " 294.01 "
	17	9.00	
	18	2.00	
	19	19.00	
~~20~~	~~11.00~~	~~"~~	~~" 304.01~~ "
~~20~~	~~11.00~~		
~~21~~	~~7.15~~		
~~22~~	~~11.00~~		
~~23~~	~~Total~~		~~Carried to~~ Dec 28th 01 Room
~~25~~	~~7.00~~		
~~24~~	~~11.20~~		
~~25~~	~~6.00~~		Ref page 228
25	10.20	"	894.01

No 313 On Lamp post - between Laboratory and Shop.

Pay roll 11

Jan 5 - 1880

11.20

Commenced turning at -

Jan. 5	14.27	
" 6	20.26	
" 7	12.15	
" 8	22.80	
9	15.00	
10	19.15	
11		
12	7.00	
13	20.60	
14	22.80	
15	11.80	Total hours turned 197.13
15	11.00	
16	23.00	
17	11.00	" " " 241.13 Knott
17	8.00	
18		
19	2.00	
20	19.00	
"	11.00	" " " 281.13 "
20	11.00	
21	9.15	
22	15.45	
23	8.00	" " " 325.13 "
23	5.00	
24	18.80	
25	6.00	
26	10.20	" " " 365.13 "
28	10.40	

over

38

Jan 27 21 25-
28 11.00 Total 408.18
28 10.00
29 11.00 " 429.15
30
31
2
Glass broke and trunk with formed of platinum wires
two hours at total of 435.18

Street Lamps 39

334 Opposite Thurnwald's stable

Res. 145-
Commenced burning Jan. 5-1880 1 PM. Pd $5.16

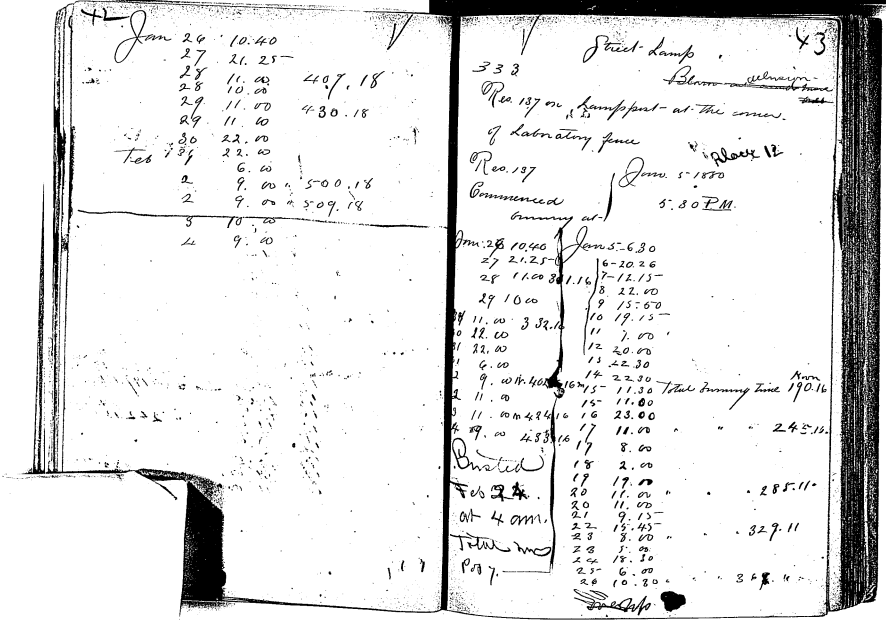
Jan. 5-	12.47	
" 6	20.26	
" 7	12.15-	
" 8	22.00	
" 9	15.30	
" 10	19.15-	
" 11	7.00	
" 12	20.00	
" 13	22.30	
" 14	22.30	
" 15-	11.30	Total time burned 189.03 nom
" 15-	11.00	
" 16	23.00	
" 17	11.00 " " "	244.03
17	8.00	
18	2.00	
18	19.00	
19	11.00 " " "	284.03
20	11.00	
21	19.15-	
22	15.45-	
23	8.00 " " "	328.00
24	5.00	
24	19.30	
25	6.00	
26	10.00 " " "	364.03

Jan 26 10.40
27 21.25
28 11.00 Total 442.08
28 10.00
29 11.00 433.08
29 11.00
30 22.00
31 22.00
Feb 1 6.00
2 9.00 " 503.08 noon
2 11.00
3 11.00 " 525.08 "
3 19.00 "
4 11.00 " 547.08
Busted March 25 1880
Total hours 1404 hours Largest
dumps —

41

Steel dumps
334 Corner opposite Baldwin's
house
Res. 1445
Commenced turning at- Jan 5 1880 11.40 Rs ~ 4

Jan 5 12.30
" 6 20.26
7 12.15
8 22.00
9 15.50
10 19.15
11 7.00
12 20.30
13 22.30
14 11.30 Total hours 197.13 noon
15 11.30
16 23.00
17 11.00 " " 242.13 "
17 8.00
18 2.00
19 19.00
20 11.00 " " 282.13 "
20 11.00
21 9.15
22 13.45
23 8.00 " " 326.13 "
25 22.00
24 19.20
25 16.00
26 10.30 " 366.13 "
over



42

Jan 26 10.40
27 21.25
28 11.00 407.18
28 10.00
29 11.00 430.18
29 11.00
30 22.00
Feb 1st 22.00
2 6.00
2 9.00 500.18
2 9.00 509.18
3 10.00
4 9.00

43

Street Lamp
333
Blum
Rec 137 on Lamp post at the corner of Laboratory fence
Rec. 137
Commenced burning at
Jan. 5-1880
5.30 PM.
Block 12

Jan. 28 10.40
27 21.25
28 11.00 3 32.16
29 10.00
30 11.00 3 32.16
31 22.00
1 22.00
2 6.00
2 9.00 with 40 167
3 11.00
3 11.00 m 434 16
4 9.00 458 16
Busted
Feb 4
at 4 o'm.
Total Time
Pd 7.

Jan 5-6.30
6-20.26
7-12.15
8 22.00
9 15.60
10 19.15
11 7.00
12 20.00
13 22.30
14 22.30
15 11.30 Total Running Time 190.16 Hours
15 11.00
16 23.00
17 11.00 " " 245.16
17 8.00
18 2.00
19 19.00
20 11.00 " " 285.11
20 11.00
21 9.15
22 15.45 " " 329.11
23 3.00
23 1.00
24 18.30
25 6.00
28 10.30 " " 364.16
Busted

47

898 Jos Chandeliers 1st from pumps
Large Carbon Burners at each end

Rec.
Commenced burning at 1 Jan. 1. 1880 3.00

Jan. 12	6.80		
13	22.30		
14	27.30		
15	22.30		
16	23.00		
17	19.00		
18	8.00		
19	19.00		
20	22.00		
21	15.45		
22	8.00		
23	18.00		
24	18.20		
25	6.30		
26	10.30		
	282.15	11	5

Pintsch Carbon at 1.00 Arthen
Lamps now per Carbon Brola
at 6 o'clock

48

342 Edison's Dining rooms

Jan 1 Chandelier farthest from door North side

Rec. 127 Jan. 6. 1880
Commenced burning at 1 P.M. 1.30 P.M.

		Jan 6	8.20	
Jan 28	11.00	13	12.15	
28	10.00	8	22.00	
29	11.00	394.15	9	15.50
29	11.00		10	19.15
30	22.00		11	7.00
31	22.10		12	20.00
1	6.00			
1	19.00	464.15	13	22.30
2	11.00			
3	21.00	446.15	14	22.30
			15	11.30 Total hours 161.10
4	9.00	506.15		11.5
			16	23.00
			17	11.00 " " 206.10
			17	8.00
			18	2.00
			19	19.00
			20	11.00 " " 246.10 "
			20	11.00
			21	9.15
			22	13.45
			23	8.00 " " 290.10 "
			23	3.00
			24	18.20
			25	6.00
			26	10.30 " " 330.10
			26	10.40
			27	11.28

289 Jos Chandler, St Jno Jamison
Rec 275

Large Custom

Commenced cunning at — Jan 12 / 1880 / 80.00

	Jan. 12	6.50	
	13	22.80	
Tel,	6:00	22.30	
2	9.00	22.30	
3	11.00	22.30	
3	22.00	23.00	
4	11.00	19.00	
	15	8.00	
Painted cutout 8		19.00	
Inside glass dr 21		8.00	
centered	21	15.45	
954 hours total	22	15.00	
	23	18.00	
	24	18.30	
	25	6.00	
	26	10.80	232.15
	26	10.40	
	27	21.25	
	28	11.00	274.20
	29	10.00	
	29	11.00	295.20
	29	11.00	
	30	22.00	
	31	22.00	340

336 Edsons dining room
Chandelier north side

Rec. 117

Commenced cunning at — Jan. 6 / 1880 / at 1.80 Plate 4

Jan.	6 8.20	
	7 12.15	
	8 22.00	
	9 15.50	
	10 19.15	
	11 7.00	
	12 20.00	
	13 22.30	
	14 22.30	
	15 11.30	Total hours 161.10
	15 11.00	
	16 28.00	
	17 11.00	206.10 Room
	17 8.00	
	18 2.00	
	19 19.00	
	20 11.00	246.10
	20 11.00	
	21 9.15	
	22 15.45	
	23 6.00	290.10
	23 5.00	
	24 15.00	
	25 6.00	
	26 11.30	330.10
	26 10.40	
	27 21.25	
	28 11.00	373.15

48

Jan. 28	10.00		
29	11.00	394.15	
30	11.00		
31	22.00		
Feb 1	6.00		
2	9.00	464.15	
3	9.00	473.15	
8	9.00	482.15	

13 [illegible] out - 1 [illegible]

66% Amer

335 — Second Chamber — Edwin Dining-room 49

Brito cook

in dining room Rs 115

Commenced burning 1 Jan. 6 1880 at 1.30 Rs 99.45

Jan 6	8.20	
7	12.15	
8	22.00	
9	15.50	
10	19.15	
11	7.00	
12	20.00	
13	22.30	
14	22.30	Rs 10
15	11.30	Total hours [illegible] in 10 nos
15	11.00	
16	23.00	
17	11.00	206.10
17	8.00	
18	2.00	
19	19.00	
20	11.00	246.10
20	11.00	
21	9.15	
22	15.45	
23	8.00	290.10
24	5.00	
25	18.30	
26	6.00	
26	10.30	330.10
27	13.40	
27	25	
27	11.00	[illegible]

Jan	28	10.00	
	29	11.00	398.15
	29	11.00	
	30	22.00	
	31	22.00	
Feb	1	6.00	
	1	9.00	483.15 from
	2	9.00	472 hours
	3	9.00	481

Posted at classes

Seems as if done as by par

343 Parlor Chandelier Dining room
Mrs Erissine Monroe South side
Res 147½

Commenced burning June. 6 1880 1.30 PM Placed at

June.	6	8.20	
"	7	12.15	
	8	22.00	
	9	15.00	
	10	19.15	
	11	7.00	
	12	20.00	
	13	22.30	
	14	22.30	
	15	11.30	Total time 161.10 hours
	15	11.00	
	16	23.00	
	17	11.00	" 206.10
	17	8.00	
	18	2.00	
	19	19.00	
	20	11.20	" 246.10 "
	26	11.00	
	21	9.15	
	22	15.47	
	23	8.00	" 290.10 "
	25	5.00	
	24	18.80	
	25	6.00	
	26	20.10	" 380.10 "
	27	20 25	
	28	8.10	
	29	12.00	" 872.15 over

52

Jan.	28	10.00
	29	11.00 Total 392.15
	30	22.00
	31	22.00
Feb	1	6.00
	2	9.00 " 472.15 Noon
	3	9.00 " 471.45

53

298 Steel-clamps in front of

Ten Cottages houses from Knees's Hall

Rec. | Jan. 6 1880

Has sent 622 | 4 FM Rec'd

June	6	8.20
	7	12.15
	8	22.00
	9	15.50
	10	19.15
	11	2.00
	12	20.00
	13	22.30
	14	22.30
	15	11.30 Total hours 161.10 Noon.
	15	11.00
	16	23.00
	17	11.00 " " " 206.10 "
	17	8.00
	18	2.00
	19	19.00
	20	11.00 " " " 246.10 "
	20	11.00
	21	9.15
	22	15.45
	23	8.00 " " 290.10 "
	24	6.00
	25	18.00
	26	6.00
	26	10.30 " " 330.10 "
	27	21.25
	28	11.00 " " 372.15
	28	10.00
	29	11.00 " " 393.15
	29	11.0 noon

54

Jan.	30	22.00
	31	22.00
Feb	1	6.00
	2	8.00 total 463.15 hours
	3	19.00 " 472.15

55

184 Jars oxalate on Laboratory Table.

Run 145

Commenced burning at | Jan. 6 1880 5 PM

Burnt 90 hours

Jan.	6	14.00
	7	12.15
	8	22.00
	9	15.50
	10	19.15
	11	7.00
	12	20.00
	13	22.30
	14	22.30 Total hours 246.50 noon
	15	11.30
	16	11.00
	17	23.00
	18	11.00 " " 291.30 noon

Bottled at 1.10 carbon broken at curve of ~~Carbon~~ hearthstone

Total hours 348.50 19/1880

Large Carbon broken at 348.50 total

Book Jno Edgeworth Sale

Rec. 133

Commenced beginning at- 1 June 5/1880 6.00 PM

Page 43

June 5	4.00	
6	20.26	
7	12.15	
8	22.60	
9	15.50	
10	19.15	
11	7.00	
12	20.00	
13	22.30	
14	22.30	
15	11.30	Total hours 158.30 mm
15	11.00	
16	23.00	
17	11.00 "	200.50
17	8.00	
18	2.00	
19	19.00	
20	11.00 "	240.50
20	11.00	
21	9.15	
22	15.45	
23	8.00 "	284.50
23	8.00	
24	15.30	
25	16.00	
26	10.30 "	324.50
26	10.40	
27	21.25	
28	11.00 "	86.25
28	10.00	
29	16.00 "	388.50

58

	28	1045-8
	30	22.50
	31	22.00
Feb	1	6.00
	2	9.00 to 845-8.55
	3	9.00 - 467.85

Brought over 9—

59

345 Jn Edwards Hall

Rev. 183

Commenced running at— June 5. 1880 6.00 PM

June 5	4.00	
6	20.26	
7	12.15	
8	22.00	
9	15.50	
10	19.15	
11	26.00	
12	22.30	
13	22.30	
14	22.30	Total hours 156.50 work
15	11.30	
15	11.00	
16	22.00	" 210.30 "
17	11.00	"
17	8.00	
18	2.00	
19	19.00	
20	11.00	" 240.50 "
20	11.00	
21	19.15	
22	15.45	
23	8.00	" 284.50 "
23	5.00	
24	18.30	
25	6.00	
26	10.30	" 324.50 "
26	10.40	"
27	21.25	
28	11.00	" 367.55
28	10.00	
29	11.00	" 388.55

Jan	28	11.00	
	30	22.50	
~~Feb~~	31	22.00	
Feb	1	6.00	
	2	9.00	Total 458.55 from
	2	10.00	
	3	~~9.00~~	" 468.55 Mark

61

35-4 Lamp post between Thimmalla stable and corner of plank walk of R 134

Commenced timing at 1 Jan 1/1880 200 . 15

Jan	7	7.20	
"	8	22.00	
	9	15.50	
	10	19.15	
	11	7.00	
	12	20.00	
	13	22.30	
	14	22.30	Total from 127.59
	15	11.30	
	15	11.00	
	16	23.00	
	17	11.00	" 152.59 "
	17	8.00	
	18	2.00	
	19	19.00	
	20	11.00	" 172.59
	20	11.00	
	21	9.15	
	22	15.45	
	23	8.00	" 236.59
	23	15.00	
	24	15.30	
	25	16.00	
	26	10.30	" 276.59 "
	26	10.40	
	27	21.25	
	28	11.00	" 8[illegible]0.04 "
	28	10.00	
	29	11.00	8[illegible] [illegible]yo

62

Jan	29	11.00
	30	22.00
	31	22.00
Feb	1	6.00
	2	9.00 Total 4 11.04
	3	11.10
	3	11.00 " 433.64 from

13 [illegible] 1890

63

365 Jno Rhuman house

Red 110

Commenced running at — Jan 8. 1890 4.00 P.M.

21

Jan	8	8.00
	9	13.00
	10	10.15
	11	[illegible]
	12	20.00
	13	22.00
	14	22.30
	15	11.30 Total hours 112 1/2 5 from
	15	11.00
	16	23.00 " 160.15 "
	17	11.00
	17	8 [illegible]
	18	2.00
	19	1.00
	20	11.00 " 200.15 "
	20	11.00
	21	9.45
	22	15.45
	23	8.00 " 244.15 "
	24	5.00
	25	18.30
	26	6.00
	26	10.30 " 284.15 "
	27	10.40
	28	21.25
	28	11.00 " " 326.20
	29	10.00
	29	11.00 " " 347.20

over

64 Jan 29 11.00
30 22.00
31 22.00

Feb 1 6.00
2 9.00 Total 417.20 from
3 11.00
3 11.00 " 439.20 "
4 11.00 " 461.20 "

B. steel

393 Over Flammerb Work 61

Experimental Tips

" No. 125 " Jan 9 1880

Commenced burning at 4.00 59

Jan 9	22.00	
10	19.15	
11	7.00	
12	11.00	
13	22.80	
14	22.80	
15	11.30	Total Time 122.15 from
15	11.00	
16	23.00	
17	11.00	" 168.15 "
17	8.00	
18	2.00	
19	19.00	
20	11.00	" 208.15 "
20	11.00	
21	9.15	
22	15.45	" 252.15 "
23	8.00	

Broken on Jan 24 1880

Total Time burned 262.15

66

312 Over Ft Cummings Bemb 67

Experimental tips.

Rec. 124

Commenced Jan 9 1880 4 00 PM

57

Jan. 9	11 00		
10	19.15		
11	7.00		
12	20.00		
13	22.30		
14	22.30		
15	11.30	Total hours 128/15 over	
16	11.00		
16	23.00		165.15 "
17	11.00	"	
17	8.00		
18	2.00		
19	19.00		
20	11.00	"	207.15 "
20	11.00		
21	9.15		
22	15.45		252.15 "
23	8.00	"	
23	5.00		
24	8.00		
25	6.00		
26	10.00	"	392.15 "
26	10.40		
27	21.25		
28	11.00	"	335.20
28	10.00		
29	11.00		356.20
29	11.00		
30	22.00		
31	22.00		one
Feb 1	6.00		
2	9.00		426.20

Feb 2 11.00
" 3 11.00 Total 46 8 hours
" 3 41.00
" 11.05 " 470 "

1 Sister Edwin take up before
Hon sam Rose Fiske

Regulated

378 Jon Clement Stine

Res. 112
Commenced running at- | Dem 4.00 53

Jan. 9	2.50	
10	19.15	
11	20.00	
12	20.00	
13	22.30	
14	22.30	
15	11.30	Total hours 120.05 Rose
16	11.00	
17	8.00	" 174.05 "
17	11.00	
18	8.00	
19	12.00	
19	19.00	
20	11.00	" 214.05 "
20	11.00	
21	9.16	
22	15.45	
23	8.00	" 258.05
23	5.30	
24	19.00	
25	6.00	
26	10.30	" 298.05
27	21.25	
28	11.00	
28	10.00	
29	11.00	" 340.30

over

70

Jan	29	11.00
	30	22.00
	31	22.00
Feb	1	6.00
	2	9.00 Total at 11.30
	2	11.00
	3	11.00 " 433.30
	3	11.00
"	"	11.00 " 457.30.

Boated March 18, 1880
at 9008 Total hours 1084 hrs

71

865 Jr Steamer Dominion Dixie

Rec. 120

Commenced running at- Jan. 8 1880 5.00 PM 52

Jan.	9	7.50
	10	19.15
	11	7.00
	12	20.00
	13	22.30
	14	22.30 Total hours 12005 Mark
	15	11.30
	16	22.00
	17	11.00 " 174.00
	17	8.00
	18	2.00
	19	19.00
	20	11.00 " 214.05
	20	11.00
	21	9.15
	22	15.45 " 258.05
	23	8.00
	24	5.00
	24	13.30
	25	6.00
	26	10.30 " 298.05
	26	20.40
	27	21.40
	28	21.25
	29	11.00 " 362.50
	29	11.00
	30	22.00
	31	22.00

72

Feb.	1	6.00	
"	2	9.00	Total 443.30 hours
"	2	11.00	
"	3	11.00	" 465.30 hours

= Protect at al- gloves, each
female at clamps

378 Jno. Carmichael's Dive 73

Rec'd 2

Commenced turning at 1 Jan 8 1880 5.00 PM

22.

Jan	9	7.30	
	10	19.15	
	11	7.00	
	12	20.00	
	13	22.30	
	14	22.30	Total hours 120 45 HOON
	15	11.30	
	15	11.00	
	16	22.00	
	17	11.00	" 164.45 "
	17	8.00	
	18	21.00	
	19	19.00	
	20	11.00	" 200.45 "
	20	11.00	
	21	9.15	
	22	15.45	
	23	8.00	" 244.45 "
	2		

to Colonel — gain hours 244 hours
is correct there seven hours

74

75

352 On lamppost at top of stairs to Depot South side from lamppost between Office and bus

Reo. 122

Commenced burning at Jan 10 1880 11.00 PM

Page 19

Jan. 10	9.15	
11	7.00	
12	20.00	
13	22.30	
14	22.30	
15	11.30	Total time 10215 Hours
15	11.00	
16	23.00	
17	11.00	" " 15-7.15"
17	8.00	
18	2.00	
19	19.00	
20	11.00	" 190.15"
20	11.00	
21	9.15	
22	15.45	
23	8.00	" 234.15"
23	2.00	
24	18.30	
25	6.00	
26	10.00	" 274.15"
26	10:40	
27	21.40	
28	21.25	
29	11:00	" 298.30
29	11.00	
30	22.00	
31	22.00	
Feb 1	6.00	
2	9.00	" 408.30 one

76

Feb. 2 11. 00
3 11. 00 Total 30, 30 hours

366 Mr Upton's Running room 77

Rec. 130

Commenced burning at- Jan. 8 1880 Place 27
4 00

Already burned
6.50

Jan 8	22. 00	
9	20. 50	
10	19. 15	
11	7. 00	
12	20. 30	
13	22. 30	
14	22. 30	Total burning 130 25 hours
15	11. 30	
15	11. 00	
	23 00	
16	11 00	" 175. 25 "
17		
17	8. 00	
18	2. 00	
19	19. 00	
20	11. 00	" 245. 21 "
20	11. 00	
21	9. 11	
22	15. 45	
23	8. 00	" 25. 9. 25 "
23		
24	5. 00	
25	19. 30	
26	6. 00	
27	10. 00	" 299. 21 "
28	11. 40	
29	21. 25	
29	11. 00	" 343. 00 "
29	11 00	
30	22, 00	
31	22. 00	" 413. 30 "

over over

78

Feb 1	6.00
2	9.00
2	11.00
31	11.00 Total 430.30 Hours

79

Star Lamp fount by machine shop. No. 35-3

Rec. 135 — Commenced burning at — Jan 5. 1880 11.20 Pence 10

Jan 5	14.27	
6	20.26	
7	12.15	
8	22.40	
9	15.00	
10	19.15	
11	7.00	
12	20.00	
13	22.30	
14	22.30	
15	11.30	
16	18.30	
16	23.00	
17	11.00	Total hours 241.13 Hours
17	8.00	
18	2.00	
19	19.00	" 281.13 "
20	11.00	
20	11.00	
21	9.15	
22	15.45	" 825:13 "
23	8.00	
23	5.00	
24	18.30	
25	6.00	" 865:13 "
26	10.30	
~~Received~~	~~2 Pint 26/1882~~	
~~Ben. S~~	27	Down from 3
	28	

Jan 26 10.00 361
" 27 21.40
" 28 21.20
" 29 11.00 429.18

Boated at 2.00 Jan 29 1880

429.18 Hours Total Time hours through Boated but Ground conditions taken Freed all night

29 11.00
30 22.00
31 22.00
Feb 1 6.00
" 2 9.00 Total hours 99.18 hours
" 3 11.00
" 4 11.00 " " 521.18 "

Total

Boated on Feb 26 1880
Total hours boated at pas.

1884 Jan Laboratory in hand lamps on table

Rec 114 8

Communicated burning at

Jan 10/1880 2.00 PM

Jan 11 3.00
12 20.30
13 22.30
14 22.30
15 11.30 Total hours burning 89.00 hours
16 23.00
17 11.00
17 8.00
18 2.00
19 19.00 173.00
20 11.00 " " 89.00 "

hours 178 Moved to chemical water side near organ

Burned three entire bottles

82

83

349 Post-in office in Machine Shop

Rec'd 142

Commenced running at | Jan. 8 1880 | 7.00 | Peace 34

Jan	8	5.00	
	9	15.50	
	10	19.15	
	11	7.00	
	12	20.00	
	13	22.30	
	14	R 2.30	
	15	11.30	Total running 125.55 hours
	16	23.00	
	17	11.00	
	17	8.00	
	18	2.00	
	19	19.00	
	20	R. 18	250.50
	21	VR 15	
	22	11.45	
	23	R 8.30	
	24	18.00	
	25	R 6.00	299.85
	26	10.20	
	28	10.00	
	29	21.40	
	28	20.25	
	28	11.00	342.40
	29	11.00	
	30	12.00	
	31	22.00	
Feb	1	4.00	
	2	9.00	512.40 hours
	2	19.50	
	3	11.00	534.40

10

10 hours Extra Duty
Changed ~~to~~ Engine to run
Feb 18 1880 same as
this 12 Inch ~~to~~ Boiler

350 Jos Offie in Machine Shops 85

No. 139

Commenced running at | June 8 1880 | 1.00 P.M. Time 33

June 8	5.00	GC	230
9	19.00		
10	18.30		6.10
11	2.00		
12	20.00		6
13	22.30		112.35
14	22.30	Total hours run	
15	11.30		
16	10.		
17	10.00		
18	10.00		6
19	10.00		
20	10.00		
21	10.00		
22	10.00		
23	10.00	" 302.50	
24	10.00		
25	6.00		
26	20.40		
27	21.40		
28	21.25		
29	11.00	" 283.40	
29	11.00		
30	22.00		
31	22.00		
Feb 1	6.00		
1	9.00	" 353.40	
2	11.00		
3	11.00	" 385.40	

Put in Engine with ~~old~~ circle of engine and new bronze slide

Stg Engine next to D.L.

Bristol on Feb 12 1880 at 1pm 12th Bristol-mpsto 496 hmes Bristol Bristol 4-5-00 o'clock

889 Jrn front of Edwards house

Rea 120

Commenced running at- | Jan. 12/880 9.00 AM. Place 2

Jan. 12	19.00	
13	22.30	
14	22.30	
15	11.30	Total hmes 69.30 hrm
16	23.00	
17	19.00	
	2.00	
18		
19	19.00	
20	22.00	
21	9.15	
22	15.45	
23	13.00	
24	18.30	
25	6.00	
26	10.30	" 215.00
26	10.00	
27	21.40	
28	21.25	" 289.15 "
29	11.00	
29	11.00	
30	22.30	
31	22.00	
Feb 1	6.00	
2	9.00	" 339.15 hrm
2	11.00	
3	11.10	" 361.15 " ✓

Drifty cattle broken on Cramp not ascertained

Malett

1875 — Jas Grant J. Office South side Ennerdale
Rec. 191½
Commenced running at | Jan. 12/1880 10.00 AM Prince 8

Jan 12	11.00	
13	22.30	
14	22.30	
15	11.30	Total hours timed 67.30 Hours
16	23.00	
17	19.00	
18	23.00	
19	19.00	
20	22.00	
21	9.15	
22	15.45	
23	15.00	
24	18.30	
25	6.00	" " 117.00 "
26	10.00	
26	10.30	
27	21.40	
28	21.25	
29	11.00	" 181.
30		

Ceased on the 29. 1880

Custom started at — 7 hrs.
Total hrs 191.30

878 Jos Kansas Stone

Pier 122

Commenced
Finishing at

June 12 / 1850
at 9 o'c PM
[illegible] see 74

June 12	June 12	12 M.	
12	13	2 2 30	
14	14	2 2 30	
15	15	11 30	T the time hours 65 30 M.
[illegible]			
[illegible]			

Lewis removed Outhouse — reporting to me

92

394 Jon Navaio Mine

93

Rec. 105

Commenced running at } June 1/1880
900 PM
Pine

June 12 12.00
13 22.30
14 22.30
15 11.30 Total hours 68.30 Hours
16 22.00
17 19.00
18 2.00
19 19.00
20 22.00
21 9.15
22 13.45
23 13.00 Total hours 190.30

~~Returned~~
Brought — ore not good enough — Return
~~Received~~

417 Jan front of two Upstairs house Corner One Uptown Yard

Res 1-31

Commence

Running at—

Corner of Yard
Jan 16/1880
5.30 PM

Jan	15	6.80
"	16	23.00
	17	19.00
	18	2.00
	19	19.00
	20	22.00
	21	9.15
	22	19.45
	23	23.00
	24	18.30
	25	6.00 Total time 168.80 mm
	26	24.00
	27	21.25 "
	28	11.00 " " 187.55 "
	29	11.00
	30	22.00
	31	22.00
Feb.	1	4.00
	2	7.00 " " 257.55
	2	11.00
	3	11.00 " " 279.55 mm ✓

Worked Feb. 20 1880 Have not been

Stamps yet. T.C.S

175 Hall Lamps in the Batteries

Rec'd. 146

Commenced burning at — Jan. 15 1880 7.40

Jan. 3	4.80	
4	8.90	
5	10.07	
6	20.26	
7	10.15	
8	22.00	
9	18.00	
10	19.15	
11	7.00	
12	20.00	Total hours 157.23 hours
13	22.00	
14	22.00	
15	22.00	
16	23.00	
17	19.00	
18	2.00	
19	19.00	
20	22.00	
21	9.15	
22	15.45	
23	18.00	
24	18.30	
25	6.00	
26	10.30	" 1 197.00
28	10.00	
27	21.45	
28	21.21	
29	11.00	" 253.06
29	11.00	
30	22.00	
31	22.00	

98

Feb 1 5.00

2 9.00 Total 923.00 hours

3 11.10 "

8 11.00 " 345.06 "

99

360 Over Flammens Bench

Rec. 125

Commenced running at- 1 Jan. 10 / 1880 4. 20 P.M.

Jan. 10	8. 50	
11	7. 00	
12	20. 00	
13	22. 30	
14	22. 30	
15	11. 30	Total hours 940.20 Worn.
16	22. 00	
17	23. 00	
18	19. 00	
19	2. 00	
20	19. 00	
21	22. 00	
22	9. 13	
23	15. 50	
24	13. 00	
25	18. 20	
26	6. 00	
	10. 00 "	258 20
		74
		8

Bristled carbon at 370.20

Large Carbon Enumerated on letter top

370 hours

~~Jno Edwards Hall~~

Jno Edwards Parlor

Jany. 5 1880

Rec.

Commenced timing at 6. PM

Jany. 5	4. 00	
6	20. 25	
7	12. 15	
8	22. 00	
9	15. 50	
10	19. 15	
11	7. 00	
12	20. 00	
13	22. 30	
14	22. 80	
15	11. 80	
16	11. 00	
17	23. 00	Total hours timed 200. 30
18	11. 00	
19	2 00	
20	19. 00	
21	22. 00	
22	9. 15	
23	15. 45	
24	13. 00	
25	18. 00	
26	6 00	
27	20. 40	
28	21. 40	
29	21. 25	" " 380. 35
30	11. 00	" "
31	11. 00	
Feb 1	22. 00	
2	8 00	
2	9. 00	" " 460. 35
2	11. 00	" "
3	11. 00	" " 482. 35

102

Packed at Jas. A. Bennett—

65 D. hams

102

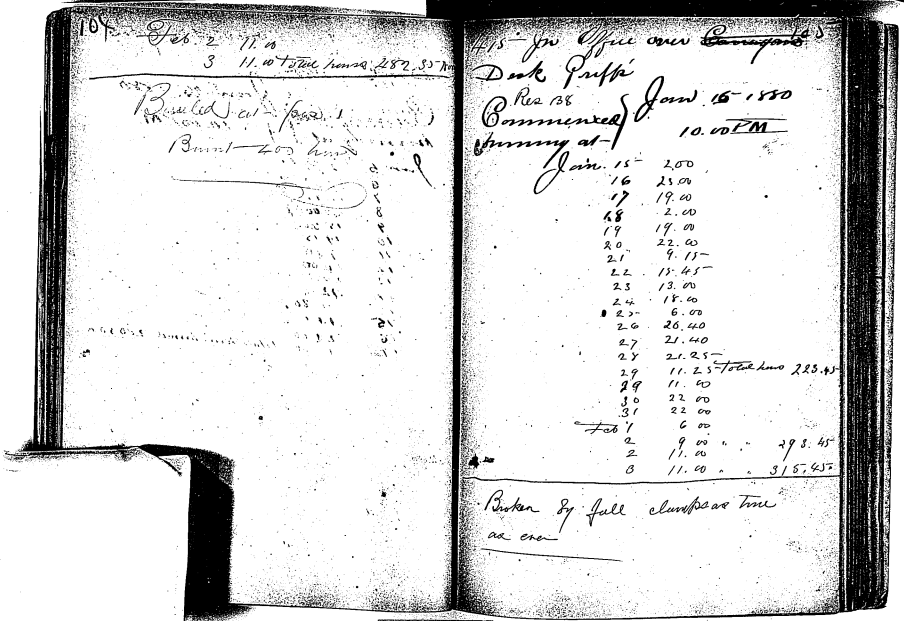
26 Jan Edrams parlor

103

Rec'd 185—

Commenced burning at— Jan. 6th 1880 6 PM

Jan. 6	4.00	
6	20.20	
7	12.15	
8	22.00	
9	15.50	
10	19.15	
11	7.00	
12	20.00	
13	22.30	
14	22.80	
15	11.80	
15	18 00	
16	23.00	
17	19.00	Total hms burned 200.50 Wm
18	2.00	
19	19.00	
20	22.00	
21	9.15	
22	15.45	
23	15.00	
24	18.00	
25	16.00	
26	20.40	
27	21.40	
28	21.25	
29	11.00	380.35
30	11.00	
31	22.40	
Feb 1	6.00	
2	9.00	460.35



105 Feb 2 11 a
3 11.10 Total hours 282.35 hrs

Rec'd on board 1
Burnt 400 bus

415 – On Voyage crew Complement 25
Duke Griffi
Rec 138
Commenced Jan. 15 – 1850
Running at 10.00 PM

Jan.	15	2.00
	16	23.00
	17	19.00
	18	2.00
	19	19.00
	20	22.00
	21	9.15
	22	15.45
	23	13.00
	24	18.00
	25	6.00
	26	26.40
	27	21.40
	28	21.25 Total hrs 223.45
	29	11.25
	29	11.00
	30	22.00
	31	22.00
Feb	1	6.00
	2	9.00 . . 298.45
	2	11.00
	3	11.00 . . 315.45

Broken by full clumpaas time as ever

4189 Batchelors Sitting Room next Door Changed to dining-room Taken down before Rec Room Rec Taken down before Rec Commenced dining at June 10 1880 10.00

June	10.	12.00	
	11	7.00	
	12	20.30	
13	13	22.30	
	14	22.30	
	15	11.00	
	16	23.00	
	17	19.00	118.30
	18	2.00	
	19	19.00	
	20	22.00	
	21	9.15	
	22	15.45	
	23	13.00	
	24	18.00	
	25	6.00	
	26	20.40	
	27	21.40	
	28	21.25	
	29	11.00	317.25
	29	11.00	
	30	22.00	
	31	22.00	
Feb.	1	6.00	
	2	9.00	387.15
	2	11.00	
	3	11.00	409.25

31 Jno Chandlee by organ
Rec. 180. Commenced trimming Feb 17
Commenced burning at 7 Jan 17. 1880 7.00

Jan.	17.	15. 00
	18	2 00
	19	19. 10
	20	22. 00
	21	9. 15
	22	15. 45
	23	8. 00
	24	18. 30
	25	6. 00
	26	21. 30
	27	21. 25
	28	22. 00
	29	4. 00

Total hours burned 182.25

Carbon broke at 10

110

360 By Microscope for 111
Light- Belongs between two Cyphers in C.B.
Pages 125-
Commenced beginning at- Jans. 15 - 1880
3.00

Pence

Jans. 15	22.20	put- back on chemistry bench
16	23.00	
17	19.00	
18	~~22.10~~	
19	19.00	
20	22.00	
21	Total gone 14	
22		
23	18.00	-154.10
24		
25	14.00	Total time out -
		282.20 ✓

Look on Page 99 Gold acc.

✓ 282 dollars 20 cts

432 on arm in engine
room at end of engine
Rec. 152 Page 37
Commenced running at- Jan. 18/1880
Jan. 19-1880 — 5.00 Examined inside cyls.

19	12.	00		
20	22.	00		
21	9.	15		
22	15.	45		
23	18.	00		
24	18.	30		
25	6.	00		
26	10.	30	Total	113.00

Bushed Carbon at- 18 Pds
Large Carbon- 9. "

113 hours

427. on side of Engine room 115

over - to Parker Enameled maids only

R 132 Fuel 36

Commenced Jan. 19 1880

running at- 3.00

19	10.00	
20	22.00	
21	9.00	
22.	25.65	
23	13.00	
24	18.00	
25	6.00	
26	20.40	
27	21.40	
28	21.25	
27	11.00	Total 177.45
29	11.00	
30	22.00	
31	22.00	
Feb. 1	6.00	
2	9.00	247.45 from
2	11.00	
3	11.00	269.00

Brought F. 21.

Total 400

428 Jno. Engine Room
near Rimmed Machines
Req. 632 Engineer by Helper: ornio
Commenced Jan. 19 1880
running at- 5.00 Feed 35-

Jan	19	18.00
	20	22.00
	21	9.15-
	22	15.45-
	23	13.00
	24	18.00
	25	6.00
	26	20.40
	27	21.00
	28	21.25-
	29	11.00 Total 175.45 room
	29	11.00
	30	22.00
	31	22.00
Feb.	1	6.00
	2	9.00 " 245.45 "
	2	11.00
	3	11.00 = 267.45 "

420 Between Office and Laboratory
Rec. 154
Commenced Jan. 18/1880
burning at 10.10 AM

Jan. 18	2.00	
19	19.00	
20	22.00	
21	9.15	
22	15.41	
23	13.00	
24	18.00	
25	6.00	
26	20.40	
27	21.40	
28	21.25	
29	11.00	Total 179.45 Mem
30	21.00	
31	22.00	
Feb. 1	6.00	
2	9.00 "	249.45 "
2	11.00	
3	11.10 "	271.45 "

Buried March 6 1880
Carbon at top
Three hours

410 Suspended on cross 12/
over Yarra pumps Please 67
Examined at Landing cross
Rec 117 June 17. 1880
Commenced 1.00 PM
running at-

Joins 17
18
19
Make up pt 20
21
22
23

Removed to Pumps post in front of
Office South Side

24
25
26
27
28
29 Total 198.03

Buxton

435 on Chandelier over organ 123
north with ✠ Laboratory enameled on
Res 15-0 tip of inside gas
Commenced burning June 20 1880
at — 2.25

June 20

Busted burning hours & made
carbons Busted at fine position
in center

1/ 8 hours

437 Ans. Chandelier second 12 from organ. South side Commencedon 3rd inside glass
Rec. 152 June 20 1880
Commenced running at- 2.30 PM
June 20
Taken out ~~Complete~~
and put in Francis desk
Burst carbon, Object in paper
Burnt 7.40. Time hours

486 Brought from Jacobs Creek and put in chandelier
Burnt about 2.00 Rec. 127
Cousins broke at 11 Position
Busted all to pieces by being
let fall by a visitor —

128

440 Jos Record — Commissioner 129
north side of carriage bolt on
made by finding mines taken from
Gov. Desk Name Jos regan Term 61
Res 145 — Jan. 20. 1880
Commenced
burning at — Commenced
61 - 9. 00 PM.

Jan 20	8. 00
" 21	9. 15
22	13. 45
23	13. 00
24	18. 00
25	6. 00
26	20. 40
27	21. 40
28	21. 25
29	22 00
30	22. 00
31	22. 00
Feb 1	6 00 Total 2. 2045
2	9. 00
2	11. 10
3	11. 00 " 242. 45

Record Burning of —
Res 6 Total hours 360

437 Dr. secured Chandelier with 3 Lights
taken and put on Jaylor
Work Rec. 152 Examined on inside glass
Commenced Jan. 20 1880
Finished 6.00 PM Place 76
Jan. 20

Boiler and Hood set—
Need but one Cooking Jor it-

132

133

438 for Telephone poles

Rec'd — Jan 20 1880
Commenced — 8.00
running at —

Total running time 2 hours
inside girls enrolled
enrolled trusted on on bike at —
3 Small centers. —

E

443 Small Custom South side 13J
2 chandeliers from organ
Roll 142
Commenced running at — | Jan. 20 1880 10.05 PM
Burned after Burning 24 minutes
Returns 5

448 Drill Caisson North side 13
2 chandelier
Rec. 138
Commenced
running ext—
Jan. 20. 1880
10:30 PM
Bored- 29 minutes
Caisson rested at- Portion 8.

434 m. Steel-Lamp base

by microscope Prime 46

Pgs. 142

Commenced Jan. 20 1880

Running at 6.00 PM

Jan	20	6.00
	21	9.00
	22	15.45
	23	13.00
	24	18.00
	25	6.00
	26	20.40
	27	21.40
	28	21.25
	29	11.00 142.45
	29	11.00
	30	21.00
	31	22.10
Feb	1	6.00
	2	9.00 212.45
	2	11.00
	3	22.00 245.45

Transfer Carbon to Pg. 6

Commencing a little above neck.

Finish Prime work

44

Hung on wires by Mr Kennye

Rec. 176

Commenced running at- Arnold system enamelled wire Jan. 20 1885 end of mast 11.19 AM

Jan 20 8.30
" 21. 4.30 apt to 8.45
Brown's extension
8.50 total time

Anchored at one

Total [illegible]
18.00

Carbon Instead Rec. 7

15 hours

423 Jos Schmeltzer near organ
Taken from hand lamp on Tube
Rev. 180. | June 21. 1880
Large Custom has burned 178 hours
from 22 at 1.00
Glass broke inside globe —
Lamp was not hot — Large custom

V 173

144

143

442 Jno Chapmaker second from organ South side Pews 60 Rec 164

Commenced running at — Jan. 20. 181 1.50 AM

Jan.	21	7. 20
	22	15. 45
	23	13. 00
	24	18. 00
	25	6. 00
	26	20. 40
	27	21. 40
	28	21. 25
	29	11. 00 Total 134.50 Norm
	29	11. 00
	30	22. 00
	31	22. 00 3
Feb		6. 00
	2	7. 00 " 204.50 "
		00
	3	11. 00 " 226.50 "

VJ water at PA

Volume number 626

458 on Cranberries by organ

North side Lewis Eastern summerhill ave.
Lot No. 157

Summer rest.
burning at—

June 22 1880 Peace 54
2.30 P.M.

June	22	5.30	
	23	13.00	
	24	18.00	
	25	6.00	
	26	20.40	
	27	21.40	
	28	21.25	
	29	11.00	Total 117.15
	29	11.00	
	30	22.00	
	31	22.00	
Feb	1	6.00	
	2	9.00	" 187.15 Acres
	2	11.10	
	3	11.00	" 209.15 "

Total hours 572

446 / Gaylor Creek
Bounds Quebec onamalek — 4½ mi
Rec 157 / Jan 22 1880
Commence 325
running at
6/5 notch Point 10.25 mi
ab Jas 2

Explor

150.

151

445- Carolyn Desk

small carbon Jan. 22. 1850

Rec'd. 145- / 2.25- A M

Cons. sent

Printed out- 9.00 small

Carbon. Printed out 11 pgs.

2.35-

1.00

1.00

4.35- hours - Lalal town

FX

#48 Jn Chemical Ltd.
Small Carbon
Reg. 175
Commenced running at 1 min. at 5.80 — Jan. 22/1880 3.80

Total running time 6 hours
carbon broke at 12 pounds broke

carbon broke clamp Classified two light
cards formed between them

JX

457. Suspended on wires

between 1 and 2 Chandelier Am. 6.0 [illegible]

No Rec : 10 plans marked on

diagram. experiment — Bristol Castor

Burnt - about - 6.30

Bristol on - 8.30

Por about 7. Heavy Belting

Total time timed 2 hours

456 Fever Con. Death
Res Lenge Cambon
Commenced June 22. 1880
Burning 9.00
Taken by Jno B. & his hand

June 28. 1880

~~Somebody stole it from Stove Closet~~
~~Rays all over house of it~~
Somebody took it in Stove Cl.
case
Thought
Bitten it drink by reading
11/2 Bright 45 Terre

158

460 Jan 23 Top of clevis downwards
Lamp-post — new front — 159
Rec'd 12th Steams — large Cabin

Commenced January 23 1880
10.00 A.M.

Jan.	23	6.30
	24	18.00
	25	6.00
	26	20.40
	27	21.40
	28	21.25
	29	22.00
	30	22.00
	31	22.00
Feb.	1	6.00
	2	9.00
	2	11.00
	3	11.00

Total hours 175.15
" " 197.15

Thonged & post on top N.

Steam
Started Feb. 18 1880
finished
Total hours

160

11

A5-0 An Hughes Deed 161

Reg 152

Commenced burning at 1

Burning 8.30 Enumerated trip

2 00

5.30 Up to 9 this

1.00 Morning

Carbon fusion 6 8 0 + one time off at both Chimneys.

Bristol 6. Pos 630

Broken afterwards by case — 630 Smouldering

466 Ox Breathes Sleek
a ball flow in carbon about
8. Another marked 466 Ox Breathes
Commenced Jan 23
burning at 11. A.M.
Broke immediately Gleason
Broke by enameling enameling
all right — and
E. T.

164

472 Over Pro. Hammers 165

Work Finished Opened ~~Closed~~ of Forge
~~No.~~ Large Combo
No. 134 Comd 24.00
Commenced 12 o'clock
burning 01 -

Jany 24	13.60
25	6.60
26	20.40
27	21.40
28	21.25
29	15.60

Brated 01 5.30 Total hrs 97.55
Comm Brated 01-9 Pro.

98 hours

178 Brewster's desk ~~U.S. 48 Stars~~ 15/7

~~Dep. from Rio Hac~~

~~Commenced~~ Jan. 22. 1880

~~Journey of~~ 180

Taken to Engine Room

and on at Engine

Jan	23	6.00	
	24	18.00	
	25	6.00	
	26	20.40	
	27	21.40	
	28	21.20	
	29	22.00	
	30	22.00	
	31	22.10	
Feb	1	6.00	
	2	9.00	Total 174.45
	3	11.10	" 196.45

Brewster Carbon at Pow. F

Feb. 18. 1880 10 PM -

Left Lucas Told.

168

17. Mrs Jardine dining room 169

Rec 14th

Commenced dinning as — June 2. 1880 Plum 39

June	2 to 3	35 : 00
	5	19. 30
	11	29. 65 4.50
	5	28 87
	6	20. 26
	7	12. 00
	8	12. 00
		15 : 30
	9	19 15
	10	7. 00
	11	20. 00
	12	22. 30
	13	22. 30
	14	11. 30
	15	11. 00
	16	22. 00
	17	3 00
Sunday	18	18. 00
to dine	19	41. 00
last the night	20	9 15
9 The 28	21	14 53
to dine lunch	22	8 00
to dine	23	18. 20
more towards	24	18 00
up and down	25	26. 80
suddenly	26	21. 25
522 Total	27	
	28	28. 00 578.08

170

487 Mrs Jinderman Brooklyn 171
Res 148
Large carbuncle | Jan. 24/1880
Commenced. 2.50 PM
Continued

Jan.	24	7.80
	25	6.00
	26	20.40
	27	21.40
	28	21.25
	29	11.00 Total hours 88.15 hours

Bandaged Carbuncle as 5 pm

88.15 Total D.C.

172

476 Mrs Jacobs Purdon 173

Rec 130 Large Cantons

Commenced running at — { Jan. 24th 1880 @ 8 a.m. PM.

Jan	24	8.30
"	25	6 m
	26	20.40
	27	21.40
	28	21.25
	29	27 m Total 84.15 Noon
	30	22.00
	31	22.40
Feb	1	16. running of Tab 2.
	2	8. m 15.15 "

Brand- time and Remarks when Pul-stand-
5 A III Total 158.15- hours

Cantons sealed at- Pos. 3.

✓ 158 hours

174

175

488 on Councillor by custom house
Rec. 155
Commenced burning at } Jan. 24th 1888
= on

Jan. 24	7.30		
25	6.00		
26	20.40		
27	21.40		
28	21.25		
29	11.00	Total 88.15 tons	
29	11.00		
30	22.00		
31	22.00		
Feb 1	6.00		
2	9.00	"	158.15 tons
2	11.00		
3	11.00	"	180.15 "

Coal - Broke at Rec. 5
Feb 11. Burnt - Total 3.5

1857 Jan Proceeding at — 177

~~Rawlins Springs~~ Pumping Gauge Central Pacific Railroad

Rec'd the Commissioners Quartermaster's Office Omaha Nebraska Ter. Jan'y 23rd 1868 11.00 PM

Jan'y 23. 5.30 Changed
24 18.00 Changed
25 6.00 to Green River
26 20.40 to Green River
27 21.40 from Pumps
28 21.25 from Pumps
29 11.00 Total 94.15 hours
30
31

Carbon treated at 9 Pos.
Very good Lasting

94 hours

178

179

1860 Jan Manistee Drive
Large Cutbanks E N
Rec. 1st
Commenced running at -
Jan. 23. 1860
4:00 PM

Jan	23	5.30
	24	18.80
	25	6.00
	26	20.40
	27	21.40
	28	21.25
	29	11.00 Total 94.15 Room
	29	11.00
	30	22.00
	31	22.00
Feb	1	6.00
	2	9.00 = 164.15 "
	2	11.10
Thur	3	11.4 = 186.15 " L

180

181

H64 Jno Harrison Dr
Rec'd Single C.m.bm & I
Jan 23. 1880
Commenced 4.00 PM
Journey at -

Jan.	23	5.80	
	24	18.00	
	25	6.00	
	26	20.40	
	27	21.40	
	28	21.25	
	29	11.00	Total 94.15 Arrow
	29	11.00	
	30	22.00	
	31	22.00	
Feb	1	6.00	
	2	9.00	" 154.15 Arrow
	2	11.00	
	3	11.00	" 186.15 " Lunch

Thence

182

183

469 Jos Klumpp Store
Lodge Custom Work
Ro. 137
Jan 23 1880

Commenced 4.00 PM
running cut

Jan 23	5.30	
24	18.00	
25	6.00	
26	20.40	
27	21.40	
28	21.25	
29	11.00	Total 94.15 hours
29	11.00	
30	22.00	
31	22.00	
Feb 1	6.00	" 164.15 "
2	9.00	
2	11.00	
3	11.00	" 186.15 "

Three

401 Harvies Olive Lodge Canton 185
Rec. 1-8 Jn C. on army uniform Entered Tofs mon

Commenced buying at — Jan. 23 1850 4.00 PM

Jan.	23	5.30
	24	18.00
	25	6.00
	26	20.40
	27	21.40
	28	21.25
	29	22.00 Total 94.15 Down
	30	82.00
	31	22.00
Feb.	1	6.00
	2	9.00 " 160.15"

Brought over from Memorandum and post over Benetts to Cash see Page 4 Book 73

186

~~465~~ Nevada State Lodge Custom 187

~~465~~ Nevada State Lodge Custom

Commenced Tiles inside

Rec.

Commenced Working on Page

Jan 23 1880

03

465 Nevada State Lodge Custom-

Commenced working

Jan. 23/1880

4. 00 P.M.

Jan	23	5.30
	24	18.00
	25	6.00
	26	20.40
	27	21.40
	28	21.25
	29	22.00 Total 94.15 Noon
	30	22.00
	31	22.00
Feb	1	6.00
	2	9.00 " 196.15 "

Brought over from previous

pro- of telephone room contract

Found on page 17 Book 78

188

45-8 Jn Commissioners Drive 189

Rio 137

Commenced running at - Jan. 23. 0800 4.00 PM

Jan.	23	5.30	
	24	14.00	
	25	6.00	
	26	20.40	
	27	21.40	
	28	21.25	
	29	11.00	Total 94.15 Nos
	29	11.00	
	30	22.00	
	31	22.00	
Feb.	1	6.00	
	2	9.00	" 164.15 "
	2	11.00	
	3	11.00	" 180.15 "

Anchored Channel 17.700 PM

Gave to the Moses

Glass drink Glass access

to the tobacco

190

467. Carnation. Dixie Jarge Cattle 881

Encumbered up

Rec. 127

Commenced Burning at- Jan 28 1910 4.00

Jan	25	5.30
	24	18.00
	25	6.00
	26	20.40
	27	21.40
	28	21.25
	29	11.00 Total 94.15 Work
	24	11.00
	30	22.00
	31	22.00
Feb.	1	6.00
	2	9.00 " 164.15 "
	2	11.00
	3	11.00 " 186.15 " ✓
~~Feb~~	~~3~~	~~11.00~~
	4	22.00

~~Balance~~ Ended at 16 Pgs.

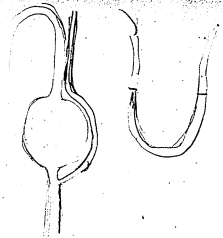
192

410. Jn limpo - forest - ponta 193
Orde office Jange Cuter G.T.
Res 117
Commenced Jan 24. 1880
timing a— 3.00

Jan	24	6.30
	25	6 00
	26	20.40
	27	21.40
	28	21.25
	29	11. 00 total 87.15 hours
	29	11. 00
	30	22. 00
	31	22-00
Feb	1	6. 00
	2	9. 00 " 157.15 "
	2	11. 00 " 179. 15 "
	3	11. 00

Bristol

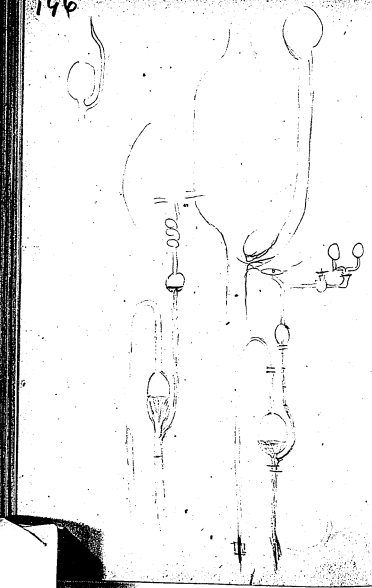
194



198 By way Optima forbes arrived 195
also others
Rio 1574
Commenced ~~ Jan 17. 1880
Journey ~~ at

Jan	17	19.00
	18	2.00
	19	19.00
	20	22.00
	21	9.15
	22	15:45
	23	13.00
	24	18.00
	25	6.00
	26	20.40
	27	20.45
	28	21.25
	29	11.00 Total hours 198.45 hours
	29	11.00
	30	22.00
	31	22.00
Feb.	1	6.00
	2	9.00 " " 268.45
	3	11.00 " " 290.45

Reached on arrival Feb. 12 1880
9.00 P.M. Total hours



#94 Jno Quincy Friend-hall

Reg. 127

Commenced running at— 1880 Jan. 26 at 12.00 noon

Jan	26	8.00	
	27	21.40	
	28	21.25	
	29	11. instead	62.05 - noon
	29	11.00	
	30	22.00	
	31	22.00	
Feb	1	6.00	
	2	7.00 "	132.05 "
	2	11.00	
	3	11.00 "	154.05 "

Jno Qcy Jr. Friend Hall. Braced at—

Pos. 8

198

L 63 Jan Mr. Batchelors Estimy rom 279
Rec 16/
Commenced
Running at
Private Customs
Comm. 11. 1850
Commercial Tapes

Practice after running on these
Tapes Rec 16. Rec.

Ex

466 Burnt 6 hours in Mr 20
Bottleless Oiling arm
Req. 146 January 3. 1880

Carbon broke at Clamps and
pos 2 and 11
another lamps broke 466 Broke
immediately Page 466

2 lamps 1 hour

#97 Small Carbon Jar Chem. Lab.
Rec Cambridge Tube on Thomas Desk
Cancelled
Rec 1420
Commenced Dec 26 1885
burning at 2.58

Broke at 8.85
5.07 Total time burned

Carbon broke out between 10 and 11

85 — Hanging on Irons by
Rod 125 — Burning pumps No. 4 —
Commenced burning at } Jan 26 1880
No. page 211 —

208

188 Chr Ann over Flammers Hooks 20
Large Custom Ornamental glass

Rec. 136

Commenced Dawn 24 1840
running at 5 40

June	24	7.30
	25	6.00
	26	20.40
	27	21.40
	28	21.25
	29	11.00 Total 78.15 Knots
	29	11.00
	30	22.00
	31	22.00
Feb.	1	6.00
	2	9.00 " 143.15 Knots
	3	11.00
	6	11.00 " 170.15 " ✓

Homer Gifford

259

Mrs Edmund Anderson

Rec 155

Commenced Jan. 26 1880

Commenced boarding at

Jan	26	3.00
	27	21.40
	28	21.25
	29	21.00
	29	11.00
	30	22.00
	31	22.00
Feb	8	6.00
	2	9.00
	2	11.00
	8	11.00

Total 137.05 Noon

" 159.05 "

210

1885 — Mrs Eavens fish-room 211
Cancelled

Rec 143

Commenced Jan. 29 1885

Longe Canton

Commenced Running at-

Jan.	26	3.00
	27	21.40
	28	21.25
	29	22.00
	30	22.00
	31	22.00
Feb	1	6.00
	2	9.00 Total 187.35 Recd
	2	11.00
	3	11.10 " 159.35 "

212

Yes

476 In Illinois Olive Bap. 213
Rec. 127 Dinah Carter. Emmeline
Commenced | Jan 26 1845
Burning of
Grove
Pa[illegible]
Carter [illegible]
Burn about 4 hours

214

Ohio Central Lines 215

1884

Under C. open Cars

Rep 142

Commenced running at 8.00 PM. Jan 26 1884 on first Chem. by passing North Side

Jan 26	4.00	
27	21.00	
28	21.25	
29	22.00	
30	22.00	
31	22.10	
Feb 1	6.00	
2	7.00	Total hours 127.25 - Revn
2	11.10	
3	11.10	" 149.25

Left - 1000 ft

Found in Cleveland Line

48 Ohm Wires By Mercury
Rio 145 — Small Carbon Connected
Commenced Jenny
Finished at 8.40
1 hours Carbon heated at
9 Pos.

496 Jan 10 Cotton Gin Pumps 29
Martin Dale
Jan 143

Cotton Gin 845
Engine oil -

Taken to Barnes Store
Jan 29. 1870

Look on page 268

220

221

508 Jn Swiss ½ Pumps
Enameled Large Cuban
Rec 15-1
Jan 26 1880
~~25~~ 11.00

Commenced
burning at

Finished at — 7.30

C. B mated out between C and J

Burnt 35 hours 1 flat

222

223

207 Jo. Devereux Rem. by Mr. Hamm

auditor measd - ship Jo.

No Res in book

Res

Commenced

Surveying at -

Finished - about 3 1/4 miles to Dix Payne's

3 1/4

Carbon bisected directly at - stamp

think connected to right - Old stake

creek up through the top very small

Burton

Jr

In book

Ala book page 57

Dorsal E. F

Flag on D.

9 45 ~~P~~

Booted at 9.00 Fixed out

Exactly Manilla Fiber

4.45 -- Total time

EX

226

529 Over Fresno Pumps resumed — 227

window Small Carbon Evacuated Bulbs —

Commenced running at — 1 Jan 28 1890 Hard Pressed paper
100 Ohms

Burnt 28 6 00

Res Burnt Upto Jan 29 / 32 hours Nom

J. 29

Bursted at — 2h. 00 Jan 30 / 1890

46 hours

Carbon Broke at 9 Pos.

228

229

Hanging over my Clerk 505 ✱
Bailey engaged 5th
Rd 150
Commenced June 26 1880
Running at — 2 FM Enumerator

June 26 8.00
27 20.40
28 21.25
29 11.00 Total 61.05 Noon

Taken by Pioneer by per from Edison
62 hms.

Taken by Pioneer by permission from
Jm Edison 62 hms.

97 Jn Harvest

Rec 140

Commenced Jan 28 1880 8.00 P.M.

Commenced running 11—

Jan	28	9.00	
	29	11.00	total 20. hours noon
	30	11.00	
	31	22.00	
Feb	1	22.00	
	2	6.00	
	2	9.00	" 90.00 hours noon
	3	11.00	" 112.00 " "

There.

Bins crossed at- enumerating bottom good hour burnt- 616 hours

232

Co Jos Barnes 233

Boo 127 engrossed Jan 26 1880

Commenced Journey at 3.00

Jan 28	9.00	
29	22.00	Total 20.00
30	22.10	
31	22.00	
Feb 1	6.00	
2	9.00	90.00 from
2	11.00	
3	11.00	112.00

Thurs Feb 3

~~Posted at 12 Midnight~~

~~Bismarck Feb 1880~~

Mrs

Bristol

234

235

5R Hotel

Reg 128

Commenced Examining at Jan 28 1880 8 oo

Jan	28	7. oo
	29	11. oo started 2 hours. noon
	29	11. oo
	30	22. oo
	31	22. oo
Feb	1	6. oo
	2	9. oo . 90. " noon
	2	11. oo
	3	11. oo . 112 " "

Trusted March 15 1880

2 oclock

Total hours 757

Jan 28 1880 Hotel Enrolled
Res, 35 Commenced. Jan 28 1880 2.00 PM
running at—

Jan 28 9.00
29 11.00 Total 20. noon
29 11.00
30 22.00
31 22.00
Feb 1 6.00
2 9.00 " 90.00 "
2 11.00
3 11.00 " 112.00 noon

Cotton as received [illegible]
on each [illegible]
for in Hull [illegible]
4.00 [illegible]

238

239

570 Jas Comstock Dive
Enumclaw
Rd. 136 Jan 28 1880
Commenced 3.00

Jan	28	9.00	
	29	11.00	total 20 hours run
	30	22.00	
	31	22.00	
Feb	1	6.00	
	2	9.00	98 " run
	2	11.00	
	3	11.00	112 " "

Put on Comstock wood
saw
Stone

Feb 18 1880

good run 19

240

482 Chas Ann Upton Wells Spring House 2X
(Enameled)

Rec. 126

Jan. 28. 1888

Jan. 28 26.00
29 11.00 Total 36.00 Hours
29 11.10
30 22.00
31 22.00
Feb. 1 6.00
2 9.00 " 106.00 Hours
2 17.00
3 11.00 " 128.00 "

12 Items

242

582
583 Hung by organ
Ro 124
Commenced
Finished

Jan 28. 1888
10 Bl. Manitou Pkg
Small cases

Jan 28 1.30
11.00
Jan 28 12.30 hours 23.30 hours
" 29 11.00 " "
" 30. 12.00 " 34.30 hrs nights

Finished at Wednesday at

243

244

533 On wire between Jarvis 245
and Sands annulled
Rec. 127
Commenced / January 28 1880
running dl- 11.30A
Manilla Report
Stopped at my 30 by rec.
12 hours coil breaking
Busted at 12 Jan 28 1880
Burned 34 hours total

GX

161 Jon third Commissioners Jour
ogden south side formerly on Tobe in
hand—camp changed for 253— arrivals arms
taken away Old style type with cuts

Rec. 147 } Jan 10. 1880
Hens hand— 133

Jan	10	18. 00
	11	7 00
	12	18 00
	13	22 00
	14	27.30
	15	22.00
	16	22 00
	17	18 00
	18	9 00
	19	17.00
	20	22. 00
	21	9. 15
	22	15. 45
	23	13. 00
	24	18. 00
	25	
	26	6. 00
	27	20. 00
	28	21. 40
	29	11. 00 Total 390.45 Noon
	30	11. 00
	31	22. 00
Feb	1	22. 00
"	2	6. 00
		9. 00 " 460.40 Noon
	7	11. 00
	8	11. 00 " 482.40 " V

248

Burster out of about 11.00 P.M.

Carbon broke at position 6

Total hours. 674

11

685

586 Jan Chemical Lam 249

R 157

Large C. Enam.

Commenced running at — Jan. 29 1800 6.00 PM

Jan	29.	6.00	
	30	22.00	
	31	22.00	
Feb	1	6.00	
	2	9.00	Total 68.00 Hours
	2	11.00	
	2	11.00	87.00 "

Burst out 1—11.—10.15

Burst total 242 hours

250

528 Jr Chem. Lab. 250

183

Rusted before fuel- in
carbon Dioxide at- and mean
elements Total Burning time 87 hrs

252

213

6-39. Jan Chandelier 2 arms.

Between 2 and Third chandelier
from on jam Ornate Carton mumiler
Rod 135 Paper
Commenced at Jan 29 1880
5.30
Jan 30 Finished
at 1.15 Total 7.45

Cartons take into 4 ornate pieces
Clamps trimm to one aisle.

EX

540 On mines directly non pumps
Res. 150 Carbonaceous Miscellaneous Papers
Commenced boring } Jan 29 1880.
5:20

Bored Carbonaceous Shales
Pos. 1 & 2

EX

256

257

125 - Dy Jagers Creek

Drummers Reserve

Dry Diggings

Jan 29 1880

6.40

Commenced running at

Bucket at Clamps pos 2

Do on Bank 69.20 Tons

Jan	29	5.20
	30	22.00
	31	22.00
Feb	1	6.00
	2	14.00

Total 69.20 tons

Abandoned at Clamps pos. 2

EX

527. Over [illegible] Creek 219

Rec 168

Commenced Running

Commenced L.C. Tuesday Jan 27 1880 Miners 6.00 PM

Jan 28	6.00
29	6.00
30	6.00
31	0.00
Feb ~~1~~ 2	6.00 Finished and have long hours per day
3	6.00 Total 30 hours

Changed from No Miners to Over Pioneers Bench opposite mouth of Lode.

Com. Running at ~~Pm~~ 12.10

~~Feb~~ Feb. 14/1880

Knocked off at 7.00

260

544 Bx Davis mer Pumps 260
Manilla, Canada Custom
Encumbered
$220
Commenced Jan 29. 1880
running at 10.30 PM

Jan	29	1.30	
	30	22.00	
	31	22.00	
Feb	1	6.00	
	2	9.00	Total 60.30 Runs
	2	11.00	
	3	11.00	82.30.
	3	11.00	
	4	11.00	104.30

Carbon broke 9/10 return of Tools &
6

262

5·84 Over Hammers desk 263

Res. 142 Encm. Supt Canton

Commenced running at } Jan 29 1880 Feb 10.30 PM

Jan	29	1.30
	30	22.00
	31	22.00
Feb	1	6.00
	2	9.00 Total 60.30 Kobs
	3	

Taken and sent for Blood Dy

Microscope book on rear Trolley 3

Changed to Batchelors desk

Total 342

Carson moved all — pass 7

Taken to Mariposa

Otter Res. 148

Commenced Jan. 27 1880

Commencing at

Has sent

Jan. 26 8.15

27 21.40

28 21.25

29. 11.00 Total

Jan. 29. 5-6.20

5-6.,20

Carried 29/56.20

29 6 00

30 22 00

31 22.00

Feb 1 6 00

2 9 00

2. 11. 00

3 11. 00 Total 143 Jno Dyon

Has no

Mr Sig 163

All right

546 South side first — 267

Chandelier rest — to organ

Rec. 135 — Jan 30. 1860

Commenced | Jan 30. 1860

2 00 PM

Jan 30 25.00

31 22.00

Feb 1 6.00

2 9.00

3 11.00

Total 73 hours 89.00 Rec

Exp.

268

269

545 — Jr. arm on Ore.

Clerk Douglas Carlin Engrm.

Res. 142 Jan. 30. 1880

Commenced 2.00 P.M.

running at Pioneer Custom

Braked at — 9.20

Hose turns — 4.00

5.00

8.20

17.20 Total Runs

Braked at Pts. 5

207 Jos Post Northside 2nd 272
Front of Office Bring from Edw Hoxx

Rec'd 127

Jany 1880

Hay burnt 114 hrs

Jany 8	22.00
9	15.80
10	19.15-
11	7.00
12	20.00
13	22.80
14	22.80
15	22.00
16	22.00
17	19.00
18	2.00
19	19.00
20	22.00
21	9.15-
22	15.45-
23	18.00
24	18.00
25	6.00
26	20.40
27	21.60-
28	21.25-
29	11.00 true 46 6.15 mm
30	22.00
31	22.00
Feb 1	6.00
2	9.00
3	20.00 " 5-40 15- "

12

Bristol 6611 - 6630 Feb. 12. 1880.

Total Issue 632 boxes.

Brought - from Edwin House

Lamp 353 from Lamp-post — by overtime Ship.

509. At Street Lamp Gate Corner Edwin's house

Res 165

Commenced burning at Jan 31. 1880 4. 00 P.M.

Jan 31	6. 00	—	
~~Feb~~	~~7. 00~~		
Feb 1	0. 00	✓	
2	0. 00		
3	0. 00	43 hrs	
	11. 00	Res worked ~~6600~~ hrs	

Month

Broke safety catch Iron

broke three times on Thirst post ~~Inside~~

Planed off Bristol Rd

Iron

Book

567. By office Street + South side 27
Rec. 165
Commenced beginning at — Jan 31. 1850 4. 00 PM

Jan	31	6. 00	
Feb	1	6. 00	
	2	9. a	43
	3	11. 00	
		11. 00 Dismd	K B Thorn

Market east running at —
Rec 8
Total Rec 443

Rec 748 Feb. 27. 1850

Date		Wheat Quantity	Wheat Amount	Wheaten Flour Quantity	Wheaten Flour Amount	Total Amount	Remarks
June	2	5	30	12	00	6 30	
"	3	12	00	12	30	12 30	
"	3	1	15	10	13	7 5·8	
"	4	3	10	12	00	8 50	
"	5	12	00	12	00	12 00	
"	5	5	40	12	00	6 20	
"	5	1	60	5	00	4 60	
"	6	12	00	12	00	12 00	
"	6	1	34	9	00	7 26	
"	7	1	00	7	00	6 00	
"	7	5	45	12	00	8 25	
"	8	1	00	12	00	11 00	
"	8	1	00	6	00	5 00	
"	8	2	00	12	20	5 20	
"	9	2	00	12	20	5 20	
"	9	1	00	5	00	4 00	
"	9	3	10	12	00	6 50	
"	10	12	00	6	00	6 00	
"	10	1	00	12	00	5 00	
"	10	1	00	9	15	8 15	149.15
"	11	5	00	12	00	7 00	
"	12	12	00	6	00	6 00	
"	12	2	00	12	00	5 00	
"	12	1	00	4	00	3 00	
"	12	5	00	12	00	6 00	
"	13	12	00	5	00	9 00	
"	13	6	00	12	00	6 00	
"	13	1	00	12	00	11 00	

Date		Wheat Quantity	Wheat Amount	Wheaten Flour Quantity	Wheaten Flour Amount	Total Amount	Remarks
June	14	12	00	6	00	6 00	
"	14	7	00	12	00	5 00	
"	14	1	00	12	00	11 00	
"	15	12	00	6	00	6 00	
"	15	7	00	12	00	5 00	
"	15	1	00	12	00	11 00	
"	16	12	00	12	00	12 00	
"	16	1	00	12	00	11 00	
"	17	12	00	6	00	6 00	
"	17	7	00	12	00	5 00	138.30
"	17	1	00	12	00	8 00	12.00
"	18	10	00	12	00	2 00	2.00
"	19	12	00	6	00	6 00	6.00
"	19	10	00	12	00	2 00	2.00 18.00
"	20	12	00	6	00	14 00	12.00
"	20	7	00	12	00	5 00	6.00
"	20	1	00	12	00	5 00	35.00 11.00
"	21	12	00	12	00	12 00	0
"	27	12	00	12	00	5 45	
"	22	12	00	6	00	6 00	Putting in new belt
"	22	7	00	9	00	2 00	Total 17.45
"	22	1	15	12	00	7 45	
"	23	12	00	6	00	6 00	
"	23	1	00	9	00	2 00	
"	23	7	00	12	00	5 00	
"	24	12	00	6	00	6 00	
"	24	1	00	12	00	5 00	Mills being Cleaned

Date	Hours Engaged	Hours Idle	Miles Run	Tons Carried	Remarks
Jan 24	4	30	12	00	7	50	
" 25	6	00	12	00	6	00	
" 25	12	00	6	00	6	00	
" 26	7	00	12	30	4	30	
" 26	1	00	8	40	2	40	
" 26	12	00	8	00	8	00	10.40 1040
" 27	12	00	6	00	6	00	
" 27	7	00	12	00	5	00	11.00
" 27	1	35			10	35	10.35 2125
					6	00	
					5	00	
	1	00	12	00	11	00	21.00 22
" 29	7	00	8	00	8	00	
" 29	6	00	12	00	5	00	16.00
" 29	1	00	12	00	10	00	29 11
" 30	12	00	6	00	6	00	
" 30	7	00	12	00	5	00	"
" 30	7	00	12	00			
" 30	1	00	12	00	11	00	30 22.00
Feb 31	12	00	6	00	6	00	
" 31	7	00	12	00	5	00	31 12.00
" 31	1	00	12	00	11	00	
Feb 1	6	00	12	00	6	00	Feb 1 6.00
" 2	12	00	6	00	6	00	" 2 11.00 Mon
" 2	7	00	12	00	5	00	
" 2	1	00	12	00	11	00	

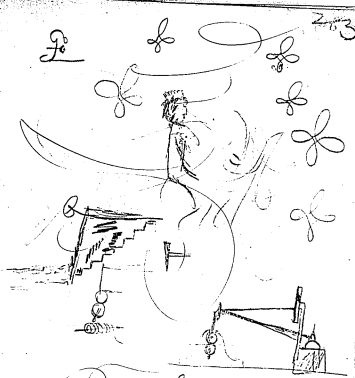
Date	Hours Engaged	Hours Idle	Miles Run	Tons Carried	Remarks
Feb 3	12	00	6	00	6	00	
" 3	7	00	12	00	5	00	
" 3	1	00	12	00	11	00	22.00
" 4	12	00	6	00	6	00	
" 4	7	"	12	00	5	00	11.00 Mon
" 4	1	00	12	00	11	00	
" 5	12	00	6	00	6	00	
" 5	7	00	12	00	5	00	
" 5	1	00	12	00	11	00	22.00 "
" 6	12	00	6	00	6	00	
" 6	7	00	12	00	5	00	11.00
" 6	1	00	12	00	11	00	11
" 7	12	00	12	00	22	00	Tend Engineers
" 9	12	00	11	00	22	00	" " "
" 10	10	00			10	00	

No. of Leaves	Page	No. of Leaves	Page	No. of Leaves	Page	No. of Leaves	Page	No. of Leaves	Page
100		200		300		400		500	
159	1	229	59	315	37	423	110	417	95
~~159~~	~~1~~	209	271	334	39	425	105	~~200~~	
200	3	265	26	331	41	428	111	415	103
155	4			333	43	431	107	418	109
201	5			342	45	360	111	451	109
169	6			336	47	398	107	432	113
172	7			335	49	398	44	427	117
158	8			343	51	309	223	428	117
270	9			340	57			420	119
242	10			345	59			410	121
108	21			354	61			431	123
153	23			365	63			437	125
224	25			373	65			436	127
170	27			372	67			440	129
168	29			378	69			457	131
184	31			365	71			438	133
192	33			373	73			443	135
210	35			352	75			444	137
218	37			366	77			406	139
198	39			353	79			441	141
161	41			325	81			423	143
208	43			349	83			442	145
188	45			330	85			453	147
179	47			388	87			447	149
161	49			393	89			445	151
				398	91			448	153
				396	93			432	155
				371	97			456	157
				363	99			460	159
				329	101			490	161
								496	163

No. of Leaves	Page
472	165
470	167
481	171
470	173
403	175
457	177
468	179
464	181
469	183
461	185
467	187
458	189
467	191
440	193
463	199
466	201
455	195
~~494~~	~~197~~
458	207
499	209
465	211
496	213
484	215
498	217
496	219
483	221
508	223
506	225
507	231
579	233

Nr.					
500		500			
502	233				
509	237				
510	239				
482	241				
532	243				
533	245				
536	249				
528	250				
539	253				
540	255				
525	257				
527	259				
544	261				
534	263				
363	265				
546	267				
545	269				
207	271				
567	573				
667	275				

Fortsetzung in Band 13



28

555
~~556~~ Went to England
556
554
553 550. Brake Pg clamp
559 and civil Instrgr.

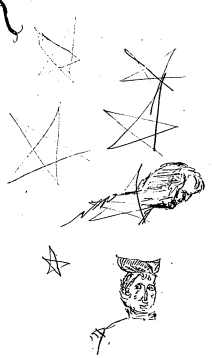
Mrs Jobs

5:27 12. 68

13

R & Co

J.H.



Menlo Park Notebook #75 [N-80-06-10] (NOT FILMED)

This notebook covers the period June-September 1880. It consists entirely of mathematical calculations by Francis Jehl. The inside front cover is labeled "No 2 Francis Jehl Menlo Park NJ." The book contains 284 numbered pages.

Menlo Park Notebook #76 [N-80-01-30]

This notebook has no dated entries but was probably used at the beginning of 1880. It contains notes, calculations, and tables relating to copper conductors. All of the entries are by Charles L. Clarke. The inside front cover is inscribed "C. L. Clarke." The book contains 284 numbered pages.

Blank pages not filmed: 26-284.

Missing page numbers: 1-4.

Using the formula $L = \sqrt{\frac{(10.642127259595)L}{R}}$,

We have when:-

$R = \frac{1}{2}$ ohm,

$L^2 = 21.284254595 19\,l$,

$L = 4.613486\sqrt{l}$,

$R = 1$ ohm,

$L^2 = 10.64212725595\,l$,

$L = 3.262223\sqrt{l}$,

$R = 1\frac{1}{2}$ ohms,

$L^2 = 7.094748484\,l$,

$L = 2.6636\sqrt{l}$,

$R = 2$ ohms,

$L^2 = 5.321063629 75\,l$,

$L = 2.306743\sqrt{l}$,

$R = 2\frac{1}{2}$ ohms,

$L^2 = 4.256850903 8\,l$,

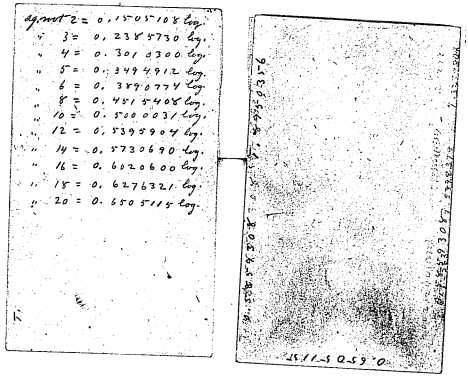
$L = 2.063213 7\sqrt{l}$,

$R = 3$ ohms,

$L^2 = 3.547375753 17\,l$,

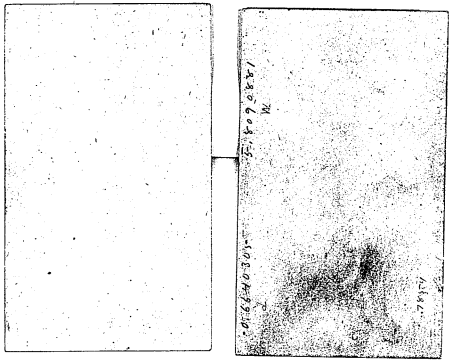
$L = 1.883345\sqrt{l}$,

[ITEM FOUND IN BOOK]



log. 2 = 0,15051108 log.
" 3 = 0, 23855730 log.
" 4 = 0. 30103000 log.
" 5 = 0. 34949412 log.
" 6 = 0, 38907774 log.
" 8 = 0, 45154084 log.
" 10 = 0. 50000031 log.
" 12 = 0, 53959074 log.
" 14 = 0, 57306990 log.
" 16 = 0. 60206000 log.
" 18 = 0, 62763211 log.
" 20 = 0. 65051154 log.

[ITEM FOUND IN BOOK]



$R = 4$ ohms,
$I^2 = 2.660531814187\, l$,
$I = 1.631115\sqrt{l}$.

$R = 5$ ohms,
$I^2 = 2.128425454519\, l$,
$I = 1.458991\sqrt{l}$.

$R = 6$ ohms,
$I^2 = 1.773685878766\, l$,
$I = 1.331791\sqrt{l}$.

$R = 7$ ohms,
$I^2 = 1.520303895136\, l$,
$I = 1.232981\sqrt{l}$.

$R = 8$ ohms.
$I^2 = 1.330265907407\, l$,
$I = 1.153483\sqrt{l}$,

$R = 9$ ohms,
$I^2 = 1.182458584447\, l$,
$I = 1.087411\sqrt{l}$,

$R = 10$ ohms,
$I^2 = 1.064721272595\, l$,
$I = 1.03161\sqrt{l}$.

Page 4 we have the weight of any length of copper wire, with a conductivity 97,
$W = .000003027\, I^2 l$, in lbs.
Substituting the values of I^2 which have just been given we have:-

When $R = \frac{1}{2}$ ohm,
$W = .000064427441\, l^2$,

$R = 1$ ohm,
$W = .000032213721\, l^2$,

$R = 1\frac{1}{2}$ ohms,
$W = .000021475814\, l^2$,

$R = 2$ ohms,
$W = .000016106860\, l^2$,

$R = 2\frac{1}{2}$ ohms.
$W = .000012885486\, l^2$,

$R = 3$ ohms.
$W = .000010738071\, l^2$,

$R = 4$ ohms.
$W = .000008053433\, l^2$,

8

$R = 5$ ohms,

$W = .000006442947\, I^2$,

$R = 6$ ohms,

$W = .000005369\, I^2$,

$R = 7$ ohms,

$W = .000004602\, I^2$,

$R = 8$ ohms,

$W = .000004026\, I^2$,

$R = 9$ ohms,

$W = .000003579\, I^2$,

$R = 10$ ohms,

$W = .000003221\, I^2$,

In order to facilitate the calculation of the tables the value of I will be taken to four decimal places, and the value of W will be taken to the first four digits.

We then have for the values of I and W by which the tables are made:—

		Logarithms of constants.
$R = \frac{1}{2}$ ohm	$I = 4.6135\sqrt{I}$,	0. 66403
	$W = .0006443\, I^2$,	$\overline{5}$. 80909
$R = 1$ ohm	$I = 3.2622\sqrt{I}$,	0. 51351
	$W = .0003222\, I^2$,	$\overline{5}$. 50799
$R = 1\frac{1}{2}$ ohms	$I = 2.6636\sqrt{I}$,	0. 42547
	$W = .0002148\, I^2$,	$\overline{5}$. 33263
$R = 2$ ohms	$I = 2.3067\sqrt{I}$,	0. 36299
	$W = .0001611\, I^2$,	$\overline{5}$. 20710
$R = 2\frac{1}{2}$ ohms	$I = 2.0632\sqrt{I}$,	0. 31454
	$W = .0001289\, I^2$,	$\overline{5}$. 11025

		Logarithms of Constants
$R = 3$ ohms	$d = 1.8835\sqrt{l}$.	0.27497
	$W = .000010794\,l^2$,	$\bar{5}.03100$
$R = 4$ ohms	$d = 1.6311\sqrt{l}$,	0.21248
	$W = .000008053\,l^2$,	$\bar{6}.90596$
$R = 5$ ohms	$d = 1.4589\sqrt{l}$,	0.16403
	$W = .000006443\,l^2$,	$\bar{6}.80909$
$R = 6$ ohms	$d = 1.3318\sqrt{l}$,	0.12444
	$W = .000005369\,l^2$,	$\bar{6}.72989$
$R = 7$ ohms	$d = 1.2330\sqrt{l}$,	0.09096
	$W = .000004602\,l^2$,	$\bar{6}.66295$
$R = 8$ ohms	$d = 1.1535\sqrt{l}$,	0.06202
	$W = .000004027\,l^2$,	$\bar{6}.60498$
$R = 9$ ohms	$d = 1.0874\sqrt{l}$,	0.03639
	$W = .000003579\,l^2$,	$\bar{6}.55976$
$R = 10$ ohms	$d = 1.0316\sqrt{l}$.	0.01351
	$W = .000003221\,l^2$,	$\bar{6}.50799$

12

1/2 Ohm Resistance.

Distance	Length of Conductor	Diam.	Area	Weight per foot	Total Weight	Cost
20 ft	40 ft.	.029 in.	sq. in.	Lbs.	.103 Lbs.	
40	80	.041			.413	
60	120	.051			.928	
80	160	.058			1,650	
100	200	.065			2.577	
120	240	.072			3.711	
140	280	.077			5.051	
160	320	.083			6.598	
180	360	.088			8.350	
200	400	.092			10,309	
222	440	.097			12,473	
240	480	.101			14.845	
260	520	.105			17.421	
280	560	.109			20.205	
300	600	.113			23,195	
320	640	.117			26,392	
340	680	.120			29.793	
360	720	.125			33.400	
380	760	.127			37.215	
400	800	.130			41.236	
420	840	.134			45.452	
440	880	.137			49.892	
460	920	.140			54.538	
480	960	.143			59.380	
500	1000	.146			64.431	

1 Ohm Resistance.

13

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.021			1.052	
.029			.206	
.036			.464	
.041			.825	
.046			1.289	
.051			1.855	
.055			2.525	
.058			3.298	
.062			4.174	
.065			5.154	
.068			6.236	
.072			7.421	
.074			8.710	
.077			10.101	
.080			11.596	
.082			13.192	
.085			14.894	
.087			16.696	
.090			18.605	
.092			20.616	
.095			22.722	
.096			24.944	
.099			27.262	
.102			29.684	
.103			32.210	

1½ Ohms Resistance

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.017			.034	
.024			.138	
.029			.309	
.034			.550	
.038			.859	
.041			1.237	
.045			1.684	
.048			2.200	
.051			2.784	
.053			3.437	
.056			4.159	
.058			4.949	
.061			5.808	
.063			6.736	
.065			7.733	
.068			8.800	
.070			9.932	
.072			11.136	
.073			12.398	
.075			13.748	
.077			15.153	
.079			16.636	
.081			18.181	
.082			19.796	
.084			21.480	

2 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.015			.026	
.021			.103	
.025			.232	
.029			.412	
.033			.644	
.036			.928	
.039			1.263	
.041			1.650	
.044			2.088	
.046			2.578	
.048			3.119	
.051			3.712	
.053			4.356	
.055			5.052	
.057			5.800	
.058			6.600	
.060			7.449	
.062			8.352	
.064			9.305	
.065			10.312	
.067			11.365	
.068			12.476	
.070			13.636	
.072			14.848	
.073			16.111	

2½ Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight	Cost.
.013			.021	
.019			.083	
.023			.186	
.026			.330	
.029			.516	
.032			.743	
.035			1.011	
.037			1.320	
.039			1.671	
.041			2.062	
.043			2.496	
.045			2.970	
.047			3.484	
.049			4.042	
.051			4.640	
.052			5.280	
.054			5.960	
.055			6.684	
.057			7.445	
.058			8.248	
.060			9.093	
.061			9.984	
.063			10.910	
.064			11.880	
.065			12.890	

3 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight	Cost.
.012			.017	
.017			.069	
.021			.155	
.024			.275	
.027			.430	
.029			.619	
.032			.842	
.034			1.101	
.036			1.392	
.038			1.718	
.040			2.079	
.041			2.475	
.043			2.904	
.045			3.368	
.046			3.866	
.048			4.404	
.049			4.966	
.051			5.568	
.052			6.204	
.054			6.872	
.055			7.576	
.057			8.316	
.058			9.090	
.060			9.900	
.061			10.740	

4 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.010			.013	
.015			.052	
.018			.116	
.021			.206	
.023			.323	
.025			.464	
.027			.631	
.029			.825	
.031			1.044	
.033			1.289	
.034			1.559	
.036			1.855	
.037			2.178	
.039			2.525	
.040			2.899	
.041			3.300	
.043			3.724	
.044			4.176	
.045			4.652	
.047			5.156	
.047			5.681	
.048			6.236	
.050			6.816	
.051			7.420	
.052			8.053	

5 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.009			.010	
.013			.041	
.016			.093	
.019			.165	
.021			.258	
.023			.371	
.024			.505	
.026			.660	
.028			.835	
.029			1.039	
.031			1.247	
.032			1.485	
.033			1.742	
.035			2.021	
.036			2.320	
.037			2.640	
.038			2.979	
.040			3.340	
.040			3.722	
.041			4.156	
.042			4.545	
.044			4.988	
.044			5.453	
.045			5.940	
.046			6.443	

6 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.008			.009	
.012			.034	
.015			.077	
.017			.138	
.019			.215	
.021			.309	
.022			.421	
.024			.550	
.025			.696	
.027			.859	
.028			1.039	
.029			1.237	
.030			1.452	
.032			1.684	
.033			1.933	
.034			2.200	
.035			2.483	
.035			2.784	
.037			3.101	
.038			3.436	
.039			3.785	
.040			4.156	
.040			4.537	
.041			4.948	
.042			5.369	

7 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.008			.007	
.011			.029	
.014			.066	
.016			.118	
.017			.184	
.019			.265	
.021			.361	
.022			.471	
.023			.596	
.025			.736	
.026			.891	
.027			1.060	
.028			1.244	
.030			1.443	
.030			1.657	
.031			1.884	
.032			2.128	
.033			2.384	
.034			2.658	
.035			2.944	
.036			3.247	
.037			3.564	
.037			3.895	
.038			4.240	
.039			4.602	

8 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.007			.006	
.010			.026	
.013			.058	
.015			.103	
.016			.161	
.018			.232	
.019			.316	
.021			.412	
.022			.522	
.023			.644	
.024			.780	
.025			.928	
.026			1.089	
.027			1.263	
.028			1.450	
.030			1.648	
.030			1.862	
.031			2.088	
.032			2.326	
.032			2.576	
.033			2.841	
.034			3.120	
.035			3.408	
.035			3.712	
.037			4.027	

9 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.007			.006	
.010			.023	
.012			.052	
.014			.093	
.015			.145	
.017			.209	
.018			.285	
.020			.372	
.021			.470	
.022			.581	
.023			.703	
.024			.836	
.025			.981	
.026			1.138	
.027			1.306	
.028			1.488	
.029			1.678	
.030			1.880	
.030			2.096	
.031			2.324	
.032			2.560	
.033			2.812	
.033			3.071	
.034			3.344	
.034			3.629	

24

10 Ohms Resistance.

Diam.	Area.	Weight per foot.	Total Weight.	Cost.
.0065			.005	
.009			.021	
.011			.046	
.013			.083	
.015			.129	
.016			.186	
.017			.253	
.019			.330	
.020			.417	
.021			.515	
.022			.624	
.023			.742	
.024			.871	
.024			1.010	
.025			1.160	
.027			1.320	
.027			1.490	
.028			1.668	
.029			1.861	
.030			2.060	
.030			2.272	
.031			2.496	
.031			2.726	
.033			2.968	
.033			3.221	

25

Menlo Park Notebook #77 [N-79-06-16.1]

This notebook covers the period June-November 1879. Most of the entries are by Francis Upton. Included are notes and calculations relating to tests of the Edison dynamo. There are also a few drawings. Some of the entries are cross referenced to "Book 8." Toward the end of the book are notes and calculations about tests of sewing machine motors. On pages 234-235 are drawings by Edison of the telephone. The label on the front cover is marked "Faradic Machines 2 Tests." The book contains 284 numbered pages.

Missing page numbers: 175-176.

Index No. 79

Size of pulley p. 109 p. 110

Table of speeds p. 150 245

Table of Galvanometers p. 150

Connection for angle of pulley p. 114. 244

Power required to run machine p. 125 p. 209+

Constants of Tom galvs. p. 131

Siemens Strong p. 112-113

Page 161, 179, 219

Tests of Dynamos

LIBRARY OF THE

BOARD OF PATENT CONTROL,

120 BROADWAY, NEW YORK.

[illegible]

[illegible] N.Y.C.

[illegible], 189[illegible].

Results from Book 8 /

Page 91 Small Edison

Speed probably 1120

8 Ohms total 120 Volts

Circuit open	9.75	
50 Ohms	27.7	p. 92
after bringing up to 1120 by adjusting current	54.4 Volts	
30 Ohms	42.6 Volts	
20.5 Ohms	82.9	
11.2	116	p. 93
10.2	114	
7.25	111	

Grimmer on field

15.25 Ohms

123 Volts

89

2

Page 105 table of the results from Gramme

Small new machine

5.9 Ohms 117 Volts ϕ 171

3.09 H.P.

10.1 Ohms 103 Volts ϕ 172

Edison machine coils in three divisions in 3 magnet quantities

1160 revo.

p.176: 2.03 Ohms Total 32.4 Volts ϕ

2.38 28.9

1.76 35.4

2.63 28.9

1.72 37.2

---

540 revo

1.16 Ohms 12.6 Volts

.98 13.4

1.51 10. Volts

1/10 H.P.

---

800 revo. 3

p.188

1.5 4 Ohms	20 Volts	1/3 H.P.
1.0.1	24.7	
2.04	15	
1.02	25.2	

Gramme	1040 revo	
5.14	73.6 Volts	
3.96	85.6	

New machine Gramme on field

on field E.M.F. on R

11 Webers	50.5 Volts	9.1 Ohms
11.	50.4	7.7
8.55	45.7	

Running its own field.

on 6.3 Ohms	59.3	2.214
6.35	63.5	
6.3	62	

Gramme 1040 rev

6.45 Ohms . 74.4 Volts

Gramme on field

Large Edison 26 Rev

Webers on Magnet	E.M.F	Ohms
8.26	60.5	5.32
10.3	57.7	5.4
11.1	53.6	6.3
8.15	42	6.3
1.82	11.2	6.3
14.4	53.2	6.3

Large Edison 26 Rev

5.7 Ohms	62.7 Volts
5.05	62.1
6.3	56
3.95	61.4
5.1	65.7

Large 2

6.14 Ohms	59 Volts
6.1	59.7
7.1	56.4

Gramme on field 262 Rev

Webers on magnet	E.M.F	Ohms
8.3	63.3	24.6
7.86	60.9	45.3
13.3	66.9	45.3
15.8	70.	45.3
20.2	72.1	45.3

June 16 1894

Standard 200

N. 1, 2, 3. 200

The standard had more
neutral solution which
may account for the diffe

cells 50

8

New machine
Grammes on field

50 N over .71 Ohms

2°

4.		.6021
1.09		.0374
Amps	.71	.1487
7.73 Watts		.8882

2°

8.5428	
4.2714	
8882	
2.3732	

9

35.5 revs
105 in 1.33

Total 11.6 Ohms

1° 50'

~~Impedance that first made~~
one use on ~~the~~ one

to 2.1

	436	.3222	
		.6395	.8378
Amp	1.33	9.8761 -11	.8378
		.8378 19	1.7572
6.88 Watts		44.5	1.6484
			3.2782
1° 50'		11 Ohms	4.5.85
			3.2782
	8.5050		1.2403
	4.2525		.8378
	8378		.0645
	2.4147	11.6	1.9023

79.8 Volts

10 June 16 350 rwd

1242 on 1235

2°38' T.T. 9.65

Lies

2.42 .3832 .9088
4.36 .6395 .9088
comp 1.39 9.8861 1.9542
.9088 1.6484
8.11 lies 3.4202
4.5185
1.0983
12.5 dec Ht. Op.
2° 38' 2|8.6676
4.3338
.9088
2.4250
.9088
9.65 .9545
1.8733 78.2 Volts ?

June 16 3245 rwd 11

1.35-2 1.36

3° Total 8.55

48 1.35 (2.81 .4487
096 4.36 .6395
390 comp 1.38 9.8861
384 .9743
60 9.42 Wicker .9320
8.55 1.9063
80.6 Volts
Turn 48 Deflection Doubles
30 8.7188 With 52 = 44 Doubles
4.3593 2.7 .4314
.9743 .6395
2 38.56 9.8861
9.06 .9570
.9320
77.5 Volts ? 1.8890

12

3400 rev

15°5' 1.36

40 Total 7.5

50 // 5°5'

3.1 .4914

4.36 .6395

Conv. 1.33 9.8761

1.0070

7.5 .8751 10.1 Meters

1.8821

76 Volts?

4° 884435

4.42x17

1.0070

2.4147

18

174 Total 6.35

4°44'

5°38'
187 ℄ Total 5.4
revolutions per minute

revolutions per minute
210 rpm 5° 33' on Governor

187
5° 35' Total 4.8
Belt slipping very badly
#1

16

$5^{0}\ 33'$ on Gramme

200 − 203 Total 4.75 Ohms

348 resistance $5^{0}\ 33'$ on Gramme 17

124 L Gramme 1080 revs

363 running feet without Gramme

123

Total 10 Ohms

47 | 124 — 2.0924

47 — 1.6721

.4213

436 — .6395

Comp. 1.13 — 9.8861

.9469 — 8.85 Webers

88.5 Volts

$5^{0}\ 33$ — 8.9854

4.4927

2.4850

.9977 — 9.94 Webers

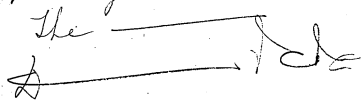
18

66 L

Total 19:3 Thurs

4 rolls Daniells 46 L
47 R

Better taken a gradually fall from beginning



New shoulder 19

next to smallest

2 Daniells 00 R

7 L 10 10

Given 1.32

1.4 .1461

4.36 .6395

Comp 1.28 .8928

678.4 4.77

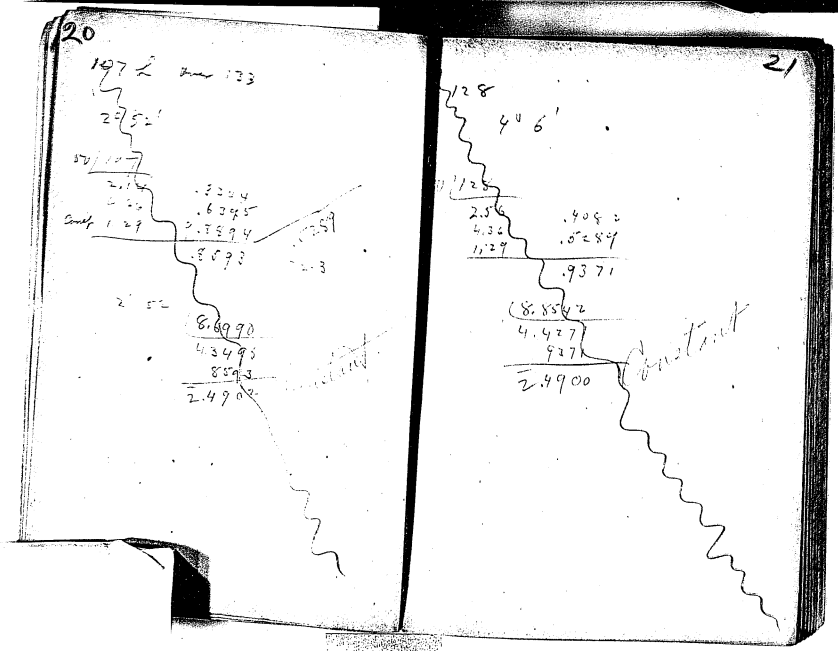
10 10

18308.7

4115.43

1.67821

2.3759 Quinton


20
197 2
133
2 5 2'
.33324
.63945
2.55994
.55693
8.69990
4.34995
.85593
2.49002
21
128
4° 6'
2.56
4.36
11.29
.4082
.05289
.9371
8.85542
4.427
927
2.4900

92

142

1.6247

50 | 142

284

.4533
.5289
.9822

440'

(89211
4.4605
.9822
2.4683

93

256

5° 50'

1150

3.0

1.71

.4771
.5289
32
1.0092

(90072
4.8035
.0092
2.4943

Constant = 2.4903 Log

94 New Chevrolet

3° 3·0 on field (340 revs

90 L 1.3

Total 12.2

3° 30 | 8.7855 | 4.3928 | 2.4900 | .8028 | 6,3,5 Watts on Field

50 / 90 | 1.8 | 4.5185 − 3.2082 = 1.3103 | .2553 | .5829 | .8282 | .0564 | .7246 | 84.1 Volts | 12.2 | 6.89 Watts | .8028 | .8028 | 9 | 44.5 | 1.6484 | 3.2082

3° 20 on field

96 L 340 revs from magnet over 1.3 | 12.2

8.9682 | 4.4841 | 2.4900 | .9941 | 4.5185 | 3.5908 | .9279 | 8.47 HP | .9941 | .9941 | .9542 | 1.6484 | 3.5908 | 1.6484 | 9.8 Watts

50 / 96 | 1.72 | .2833 | .5829 | .8662 | .0864 | .9526 | 7.35 | 89.6 Volts | 12.2

96

10 sr on field

74 340 revs Total 12. Ohms

10 .6483
10 .6483
1.6026
2.8992
4.5185
7.6193

8.2766
4.1383
2.4900
.6483

4.45 Meters

141.6 per H.P.

5 | 74
1.48

.1703
.0660
.2363
1.0792
1.3759
.1703
.5829
.7532
12 1.0792
1.8324

5.66

340 revs

68 Volts

97

340 revs

31' on field

Total 11.9 Ohms

60

31'
.4875
.4875
1.6026
2.3776
4.5185
1.9409
87.3 per H.P.

7.9550
3.9775
2.4900
.4875

3.07

5 | 60
1.2

.0792
.5829
.6621
.0755
.7376

11.9

4.59

340 revs

54.6 Volts

28

3.07	.4871
3.07	.4871
44.5	1.6484
410 ft lbs	2.6126

33000 4.5185
2.6126
1.9059

80.5 field magnets for a Horse power assuming 1 Ohm in magnet 5.46 Volts
in reality .9 Ohm
Ro 87.3 per H.P.

June 16 1899 P. 29

Gramme on field.
through galva. 340 revs
22 on 1.28 — 125

Field brought up 340 revs
40 121 3.05 Ohms Total

50 122
.44
436
1,25

7.6435	
.6396	.5426
9.9031	1.53 Ohms
0.1861	.1861
	.1861
40 1.2	1.6026
8.8647	1.9948
4.4323	4.5185
2.4704	2.5237
.9623 917	334 den 4.0
.4845	
1.4468	
2	
1.4268	26.7

27.9 Volts
365

30

2 340 rev

30 = 1.39 - .5 = 1.28

30 10' over 4.57

7.7782
.5426 Fuld
.3208 2.09 Webers

30 10' 8.7422
4.57 4.1711
4.6599
5.8310
2.4700
1.5618 36.4 Volts

340 rev

31

128 on 2.25 Ohms

4041 over 5.7 Ohms

90/126
2.5 2

Comp

2.5 4014
$.36 .5263
2.225 .46478 - 2
.8755 3.767
.5755
4.45 1,64584
2.7994 279
33 rev 4.5185
1.7192 5.7 per H.P

8.9119
#4.1455 9
5.7 .7559
52118
2.4700
.7418
2w
.7218

55.2 Volts
or
52.7 Volts

32

107° over Total in Armature amounts 9.2 Ohms

1° = ~~4.57~~

am 2.25 Ohms

34 over 32'

Total 5.87

Fill there the magnet brought up

50/182

	8.64	.5611
	4.28	.6314
Comp	2.25	9.6478
		.8403
	9.2	.9638
		1.8041

6.92 Webers

63 Volts on Armature

6° 32' 9.0560

4.5280 - 5

2.4700

1.0580

11.4 Webers

5.87 .7686

.8403 1.8266

.8403

67.1 Volts on Self Mutual

Magnet not brought up 33

Total in Armature circuits 5.1

127 over 1.74

5° 35'

Total 5.72

50/127

	2.54	.4048
	4.28	.6314
Comp	1.74	9.7895
		.7957
	8.1	.9085
		1.7042

6.24 Webers

50.6

5° 35' 8.9880

4.4940

2.4700

1.0240

5.72 .7574

1.7814

60.4 Volts

34 Magnetic brought up

150' over 177

1° 32'

Shoulder constants

2R constants

35

2R over 120

3°-5-0

5" 1.45
2.5
4.36
comp 1.29

.3979
.6395
.9031
1.9405

8 25 25
4.43 25
1.9479
2.4770

147 over 1.3

5°28'

567 Total

50 147
1.9

1.9 .2788
4.36 .6395
1.26 .9996
.0779

18.9722
4179
4.14861
1.81179
.4682

36 revolutions without load 514

With Grammaire 50 4 pour

Ohms $D = \frac{66}{120} \cdot 2$ in 1.29

2° 35'

11 Ohms Total

8.6539
4.3269
1.4700
.8569
.0414
.8973

11. 78.9 Volts

50 | 66
1.32 .1206
4.36 .6595
comp 1.29 9.8894 .5289
0.6498 4.46

magnets not completed 57
15 = 9 1.28

2° 22'

on total 4.1 Ohms

8.6158
4.3079
2.4206
.8379 6.88 Webers
4.1 .6128
28.2 Volts 1.4507

50 | 15
.3

1.4771
.5289
.1006 .1 Webers

38 Magnet brought up

66 L 504 revo

4.46 0.6495
0.6495
1.6484
2.9474

886

32000 4.5185
2.9474
1.5711

37 for N.P
78.9 Volts

504 revo 37

85

Total 11.90

3° 57'

83 | 8.8381

4.4190 4.4190
2.4700 2.4700
.9490 .9290
11.90 1.0755 1.0750
1.0040
105 Volts 2.0275 101 Volts

50/83
166

.2201
.5289
.7490 5.61 Volts
.7490
1.6784
1400 3.1464
4.5185
3.1464
2.3.5 for N.P. 1.3721

40 June 17 1879

4 Daniells 50

105 on 1.29

1.25

5/105
2.1

2.1
4.36
Comps 1.23

.5496
.8718

4.3495
.8718
∴ 2.4777

June 17 1879 4

1.50 1.29

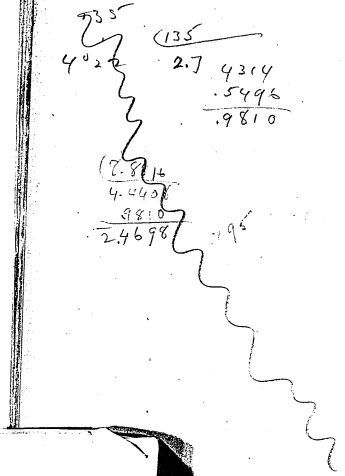
3 4771
5496
1.0267

5° 43'

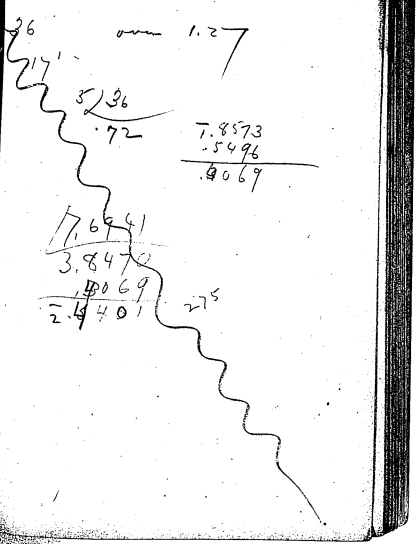
9.00 32
4.5 16
1.0 8
2.474

248

42 June 17



June 17 1879 43



4X

550 revs. running free

Gramme on field

267
534 revs

Field brought up 40 to left on field

on 1.28 — .18190 31
.5496
.45527
283 Watts

10 45'

Total

11.05 Amps

8.4848
4.2424 - 7
2.4725
11,05 a.7699
1.0434
1.81 33

65.1 Volts

Field not brought up 40

14 R

20'

.45527
.45527
45' .4484
9 .5542
2.5080 32

3.3 amps

4.5185
2.5080
2.0105

1.02 for H.P.

46

39 L

1° 42' 11.05 Ohms

8.4722
4.2361
2.4725
.7636 5.8 Webers
11.05 1.0433
1.8069 64.1 Volts

47

39 L 530 revs

2.75 Webers in circuit

20° 15' Total 8.85

8.55 9 | 8.5939
4.2969
2.4725
.8244 6.67
8.55 .9469
1.7713 89 Volts

2.75 .4393
.4393
1.6026
2.4812
4.5165
2.0373

109 per H.P.

rev. 538 with Gramme

520 circuit closed

530 running free

39 L 2.75 Webers on magnet

35° 12' Total 6.35 ?

35° 42' (8.8097
44048
-24725
.9323
6.35 .8028
1.7351

54.3 Volts ?

38-39 2.75 Webers on magnet

37° 4.75 Ohms

(9.0858
4.5429
-2.4725
1.0704 11.8

11.75 .6767
1.7471 55.8

50

532 Nevo

38 2.75 Wichsan magnet

8° 12 4.15 Ohms

2 | 9.15550
4.5775
3.4725
1.1050
4.15 .6180
1.7230

52.8 Volts

51

138
47
.91

4 Daniells . 52

59	1.7709
8.85	0.9469
6.67	.8240
65.1	1.8136
11.5	1.0607
	.7529

5.66

52

Book 8 p. 244

268 : 400 :: 64.1

64.1	1.80669
400	2.60211
Comp 268	7.57191
	1.98069

95.7 Volts if proportional to speed instead of 66

400 : 580 :: 85.6

1.25	.0969
85.6	1.9326
	2.02955

107 Volts if proportional to speed 86.4

53

500 : 731 :: 127

1H6	.1644
127	2.0899
	2.2543

179 if proportional in phase 169.

268 : 172 :: 64.1

64.1	1.80669
721	2.85719
Comp 268	7.57191 −10
	2.2357

172 in phase 169

54

340 : 530 :: 86.6

86.6	1.9375
530	2.7242
Comp 340	7.4685 − 10
	2.1303

135 Volts

268 : 1010 :: 64.1

	1.8069
	3.0043
amp 268	7.5719
	2.3831

241 Volts

in place of 210

268 : 340 :: 64.1

340	2.5315
	1.8069
	7.5719
	1.9103

81.2

55

1380	3.1399
64.1	1.8069
Comp 268	7.5719
	2.5187

330 Volts

in place 260 Volts

EMF

Speed	Observed	Calculated
268	64.1	
340	86.6	81.2
520	123.	
731	169	172
1010	210	241
1380	260	330

New machine on the field of the Grammer

Gramme 1086 ohms

H.O.R over 1.27

1° 50'

over 3.97 Ohms

1° 50'

8.5050 50/40

.8 1.9031

4.28 .6314

1.19 9.9208

.7800 286 .4553

.4553

.5933 1.6026

1.3730 2.5132

4.5185

2.00530

3.92

233 Volts

707 μ H.O

55° 1.27

2° 45'

on total 4,

8.6810

4.3405

2.4725

.8780

4 .6021

1.4801

30.2 Volts

1.1 .0414

.6314

9.9208

3.92 .5936

.5936

1.6026

2.7898

4.5185

1.7287 53.5

58

June 17

120 Over 1.27

4° 29' total 6.2

8.8930
4.4465
2.47225
.9740
6.2 .7924
1.7664
58.4 Volts

SV(120
2.4 .3802
4.36 .6395
temp 1.23 .9101
.9298
8.5 Webers

.9298
.9298
17 1.8451
44.5 1.6484
3.3531
4.5185
1.1654

14.6 per ~~24~~

3.12
2.40
.72

June 17

59

The standard cell make two new solution one with the stopper evaporated the other with some pure acid in it.

---

determine the polarization of the Gramme on the speed it is running 5 measurements

---

running upon field

Run field from Edison
15 Webers
8 Webers
3 Webers

Try polarization

Measure resistance

On the Edison I will 61
make the following tests

Put ~~two~~ 2, 3, 4, 5, 6, 7, 8, 9, 10 Webers on the field and run down the pulley.

62 June 18

No. 1 200 R

No 2 191 L

No. 3 200 R

Old Standard 198 L

200 R

No 3 192 L

New Standard 2x slightly warm

200 L

200 R

199 R

197 L

Wheeler 192 L

192 R

New 200 R June 18-63

Old 192 R

No. 3 all 190 L

No 2 186 R

No 1 192 L

New 199 L

67 Gramme on its own field.

Wells 50 L

1080 revs.

90 over .95

3°58' Total 7.6

50/90

Daniell 1.07	1.8	.2553
	4.28	.6314
Comp	.91	10.0410 - 10
		.9277
		.8808 8.46 Webers
		1.8085

64.3 Volts

3°58' 9.8399

4.4199

5.4200

.7474

4.4199 - 5

.19247

2.4922

Gramme on its own field 63

1080 revs.

152 over .95

10°37 Total 5.55 Ohms

50/152

3.04	.4829	
4.28	.6314	
.91	.0410	
	1.1553	14.3 Webers
5.55	.7404	
	1.8957	

78.6 Volts

9.2653

4.6326

7.1553

2.4773

.540

1080 revs

.075

1,100 running free

66 490 Grammme
980 revo on his own field

235 Run 1 Ohm
220 Total 3 Ohm

1.1980
.0177
1.2157

220 235
4.7 .6721
3.28 .5159
Comm Meters 1.1980
3 .47.71
1.6751
47.3 Volts .0502
1.7253 53.1 Volts
Comp .96 .0177
1.7430 55.3 Volts
55.3 corrected for fall in speed

95735
41867 41867
1.21557
2.5719 231

Brushes on commutation for best output

1090 revo June 18 67
magnet not brought up
33 R Rvor 1.27

20 / 12.4 Total

55/33
.6.6 7.1175
3.28 .5159
comp 1.23 9.2101
0.2455
12.4 1.0934
1.3559 21.8 Volts

20 / 7.7647
3.8823
2.4555
2.6368

68

1090 revs.

123 ohms 1.28

Total 7.85 ohms

40°

50 / 123

2.46 .3909

2 28 .6314

Comp 1.24 .9066

.53 AB

9.9289

7.85 .8949

1.8238

66.6 Volts

40°

8.8435

4.4217

.9289

.4828

69

June 78

Field not brought up

60 R 1890 revs

47'

Field brought up 9.47 ohms total

72 R

1° 27'

~~not brought up~~

Field opened and down to

52 standard from 43 and

run gradually 3 minutes

41' / 50 / 72

1.44

.1584

.5340

.6954

9.47 .9731

1.6675

46.7 Volts

1.5
1.0 !
.49 in armature

10 r
3 v
.71 shunt magnet

1107 revs

72 Edison on field of Grammer

50 (5-7)
1.14
1.14 lamp 1.26
.0559
.6314
.8996
.5879
3.88 Webers

Grammer field

20 41'

Total 3.94

8.6703
4.3351
2.4750
.3431
.5385
1.4356

3.94
3.88
.0579
.0579
.71 1.2513
40.8 1.4997
27.2 lbs
8.71
2.7754

33 ohms 4.5185
2.7754
1.7431

1.5356
.9701
1.6484
4.1241

85 per H.P.

13300

field brought up June 18 73

10
1.4
.5310
.1461
.6771 4.45 Webers

4° 40' 3.94 Ohms Total

8.9104
4.4552
2.4950
.9602
.5977
1.5579 36.1 Volts

714

.6771
.6771
1.4997
2.8539

4.5765
2.8539
1.6546

46.2 per H.P.

Took out resistance until Edison on 5 min

1/59 = 1.118

3° 25'

8.7752
4.3876
2.4450
.8926
4 .6021
31.2 Volts 1.4947

.5310
.0719
.6029 .401 N

4, [illegible] total Ohms

.6029
.6029
1.4997
2.7055

4.5185
2.7055
1813.0

65% H.P.

Not brought up to full

120

8.22 : 4.1 Ohms Total

9.1628
4.5814
2.4450
1.0864
4.1 .1628
1.6992

50 Volts

120
24 .3802
.5310
815 .9112

.9112
.9112
1.4997
3.3221

4.5155
3.3221
1.1934

15.6 H.P.

76

Examples

125
2.5

9° 27'
fall to
9° 12'

9.2028
4.2019
5.1250
1.1964

4.1 .6 24
1.7172

52.4 Volts

7.5 .3979
.5310
.9289

8.45 Webers

Total 4.1

1.7192
225
1.7417

553

77

Field and brought up

30
.6

30 - 29 = 1 on 1.26.6782, 7782
1° 10' see p 72 .5310
2.04 Webers .3092

Total 3.94 Ohms

50/36 .8 1° 10'

8.3087
4.1543
2.4950
4.056 Webers .6593
3.94 .5955
18 Volts 1.2548

.3092
.3092
.71 T.8513
44.5 1.6484
2.1181 131

T.8513
1.6484
1.4997

38.000 4.5185
2.1181
2.4004 250 per H.P.

No change as field brought up
30.
10 10 ½ Total 26.8

26.8 .3092
1.42781
1.7373

Field brought up

Gramme 1100 revs
30
1° 15' Total 3.91

8.3377
4.1688
2.4950
.6738
3.91 .5922
1.2660

1848 Lines

74 on field brought up

1° 15' 1.48 revs.

10.1 Ohms

74
1.48

.1703
.5310
.7013
5.03 Webers .7013
1.4997
2.9023

4.5185
2.9023
1.6162.

41.3 per H.P.

1° 15'
8.3387
4.1693
2.4950
.6743.
10.1 1.0043
1.6786

47.7 Volts

80

74

1° 30' Total 8.21 Ohms

8.5050
4.2525
2.4950
.7575 5.72 Webers
8.21 .9143
1.6718 47. Volts

81

1113 revs. 1/41.3 magnets per H.P

74 on field

Gramm 6.15

2° 46'

8.6836
4.3418
2.4950
.8468
6.15 .7889
1.6357 43.2 Volts

82

4° 29' 3.99 Ohms

4° 29' (8.8932
4.4465
2.4950
.9515 8.94 Webers

3.99 .6010
1.5525

35.6 Volts

83

1050 revs

74

5° 45' over 3.55 Ohms

(9.0008
4.5004
2.4950
.9954 9.89 Webers

3.55 .5502
1.5456 35.1 Volts

84.

1055 rpm

6° 38' Ø1.05

1.90626
4.53133
2.4950
1.03633 10.8 Webers
3.05
0.48433
1.52066 33.1 Volts

1050 rpm

85

8° 35' 2.5 Ohms

1.91739
4.58699
2.4950
1.08189 12.1 Webers
2.5
0.39794
1.47984 30.2 Volts

86

1055 rev.

11° 28 2.0 1 Ohms

4 Annulls 49 L

9.2984
4.6492
2.4950
1.1542 14.2 Webers
2.01
.3032
1.1574 22.8 Volts

87

Constant of shoulder

53 | 50 53
45 | 1.06 .0253
4.28 .6314
1.24 .9086
1.8633 .6380

comp.

2 (8.1169
4.0584
1.5633
2495

8.0

5 | 40
1.6 .2041
.5380
.7421

1° 43'

8.4765
4.2382
.7421
24961

88

109 | 109 | 2.18 | .3385 | .5350 | .8765

30° 4'

8.7283
4.3641
.8765
2.4876

140

49° 50' on 1.3 Ohms

1.25

140 | 50 | 140 | 2.8 | 4.28 | 1.25 | .4472 | .6314 | 9.9031 10 | .9817

8.9256
4.4628
.9817
2.4811

89

180 on 1.62 Ohms

180 | 3.6 | .5563 | 4.28 | .6314 | 1.58 | 9.8013 -10 | 0.9890

50° 20'

8.9682
4.4841
.9890
2.4951

142 . 1.3 Ohms

5° 18' 50 | 142 | 2.86 | .4564 | 4.28 | .6314 | 1.26 | 9.8998 -10 | .9874

8.9545
4.4772
.6314
.5400

4.4772
.9874
2.4898

140 on 1.3

5°

140	
2.8	.4472
4.28	.6314
1.26	.8996
	.9782

8.9423
4.4701
.9782
.4919

240. on 2.14

4° 59

240	
4.8	.6812
4.28	.6314
2.10	.6778
	.9904

4.4701
.9904
.4795

124 1.13

5° 81

124	
2.48	.3945
4.28	.6314
1.1	.9586
	.9845

8.9517
4.4758
.9845
.4913

64 .63

4° 57'

64	
1.28	.1072
4.28	.6314
comp .59	.2291
	.9677

8.9359
4.4679
.9677
.5002

92

30 cm 2.83 cm

55.6

2° 16' on magnet

53	$\bar{2}.4951$
80	4961
109	4876
140	4811
160	4951
173	4954
140	4919
240	4795
124	4913
84	5002

say 4950

$\bar{2}.4950$ constant

No 1 109
No 2 111 R
No 3 109 L
Standard 109 R
10% L

Wills 44

.6314
9.5157
1.5328
1.6799

beginning

amp 44 8.3565 − 10
lag 4.28 .6314
Coup 3.05 9.5157 − 10
2.5036
18 1.2553
7589 .57 Webers
54.1 1.7322
1.4911

31. Volts

2.5036
34.1 1.5328
.0364
29 1.4624
31.5 Volts 1.4988

191 382 216
352 221 432
442

Edison vs Gramme

7° 2'

Gramme 435 revs.
18 K 54.3 Ohms Total
over 3.0 Ohms

32 vs 3.0 Ohms Total
3
29 34.1 Ohms 3 Resistant

7° 2'
9.0879
4.5439
2.4950
1.0489 11. Webers
1.0489 4.5185
.71 1.8313 3.5975
44.5 1.6484 .9210
3.5975 6.3 per H.P.

585 revs

293 / 586 revs

36 on 3.05

34.1 Total

.0364
36 1.5563
1.8927 39.1 Volts

time 2.50

897 revs.

56 on 3.05
34.1 ohms total

.0364
56 1.7482
1.7846 60.9 Volts

98

Dmc 26

1324 rcvd

87

81 .0364
.9085
1949

88.1 Volts

88.1
4
3.524

88.1
3.5
846

99

6° 41'

1724 rcvd 5

6° 57'

40 / 110
2.75

amp 3.15

428 .6314
9.5-1.57 = 10
1.53 28

2.75 .4393

20 131 Volts 2.1192

4 wks 40 L

11.1 | 44.5 | .71 | T. 8573
1.6484
1.4997
1840 rmp. | 11.1 | 1.0485 3
1.0485 3
75.9 Volts | 3.5903
4.5185
8.47 per H.P | .9282

1.4997
13.6 | 1.1335
1.1335
83.1 | 3.7667
4.5185
5.65 per H.P | .7518

28.849
14.174

23 | 1.4997
1.3617
1.3617
4.2231
4.5185
.2954 | 1.9 per H.P

Examine C C

8.26 | .9170
5.16 | .9170
1.8340
2.8979
1.0639
1154

44.3 | 1.2554
.8 | .7552
1.5006
84.5185
2.8979

102

What is needed

H.P. Dynamometer

540 shunt circuit on field

680

140 lbs Edison shunt circuit

240 revs.

.54

2 feet

3.14

6.28 .7980

188. .2742

3.0722

1183 feet a minute

103

1183

60

70,640

940 Watts on scale

20 ohms entered shunt

840

755

8.5

1183

2366

4732

2366

49686 watts

104

840 2 Mins outside
675
145.

345 revolutions

1183
117.5
5915
2366
23660
2.3701

414 revs. 2 Mins outside

840 1183 3.0731
675 117.5 2.0700
235 2.1432

139,000 ft. lbs.

105

414 revs. 20 mins outside

840 11.83 3.0731
612 11.4 2.0569
228 5.1240

134,700 ft. lbs

451 revs.

840 1183 3.0731
626 15.7 2.1959
214 5.2690
185.5 4.5215
7505

4.44 H.P.

5.6 H.P.

32 32
44
32
132
1408

6 Ohms outside

[illegible]

200		
60	11'53	2.0731
155	77.5	1.8893
		4.9624

91.700

Surface

255	7.5935
	7.5935
Comp 345	2.5378
	2.5378
49.68	9.6962
	4.9588

90.900 ft lbs if on a square of shaft.

255 — 345

100	2.
10-0	2.
comp 8	9.0309
	3.1769
24.5	1.6486
	4.7453

56.600

11.5	2.0607
11.5	2.0607
	9.0986 – 10
	3.2193
	1.6486
	4.8667

73.500 lbs

13 ft 4 in

10 ft

8 ft

164

1.2104

1.1774

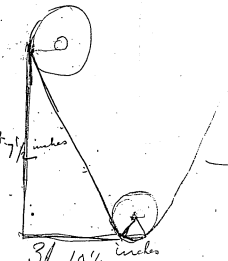
100

16

116

.0645

1.0322



13 ft 4 in
6 floor

13 ft 4
2 8½
10 ft 7½

127.5 inches
46.5 inches

Around the pulley
6 ft 2½ inches

Another measurement 6 feet 3⅛ inches 114

127.5
46.5

see page

2.5 / 12 = .208

6.208 around pulley

110 847 lbs Wt of box

124 / 2 / 248 — 4 lbs 13¾ oz revs a minute

820 lbs Pump on

840 Pump off

24 inches — 13.25 /// — 16 — 1.1222 — 1.2041 — 1.9181

248 revs. .828

24. 1.3802
3.14 .4969
Diameter 2. .3010
248. 2.3945

4.5726

inches 3.7360 — 4.5726 — 1.0792 — 3.4934

3.114 feet — .1837 — 4.0771

4.828

11.900

1183 20
2 | 23660 ft. lbs.
11830

3.14
4
12.56 1.0987
248. 2.3945
3.4932

3112 ft

11830 Edison
11900 Prony

6.75 lbs.
4.82
11.57

1.0634
3.4932
4.5566

36000

847
785
lbs 62

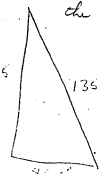
1183
62
2366
7098
73346

Edison 36.673
Prony 36000
The Prony placed on the shaft of the lower cone pulley.

114

The amount to be added since the belt is not taken the weights directly.

∴ page 109



127.5 × 2110 57

11130 | 4.2075

1.6275

2163 | 3.3350

18293 | 4.2621

2.1310

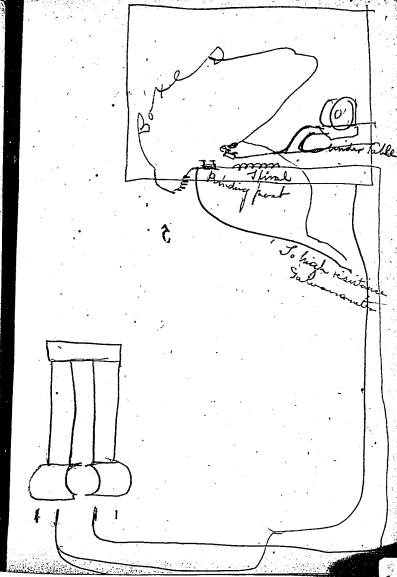
136.8 × 2.1038

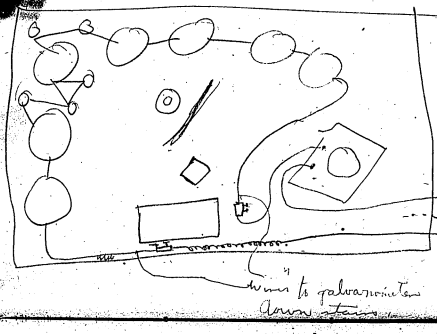
127.5

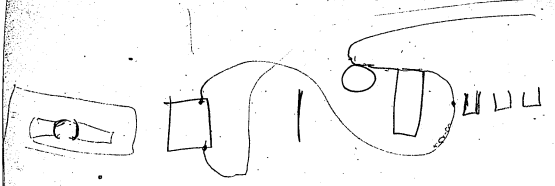
.0272

1.065 correction to be added that is result must be multiplied by this number to express true H.P.

115




under table
Lines to
Dynamo
Machine



740
1100
74
77
814,000
33) 407,000 (12.3
33
77
66
110

12 1/3 H.P.

Total amount which the dynamometer can transmit.

1150 3.0607
137 21367
5.1974

2657000
33) 77,580 (2.3
66
115
99
160

July 14th

Speed of shaft

184 per minute

74.5 1.8722
3.14 0.4969
1.37.3

23.7

2 | 74.5 inches around pulley
6.208 feet

2π 6.208 0.7929
184 2.2648
3.5577

1143 feet per minute
Speed of belts

Dynamometer

844 lbs running free on cords

837 with Edison running free

7 lbs due to Edison

655 net

1143
7
2 | 8001
4006
8001 ft lbs

33000 (4.1 H.P
2
8.2 H.P
10
82 of H.P

9 cells on magnet
830
14
8000 ft. lbs.

July 1st

Edison ~~[illegible]~~ revo

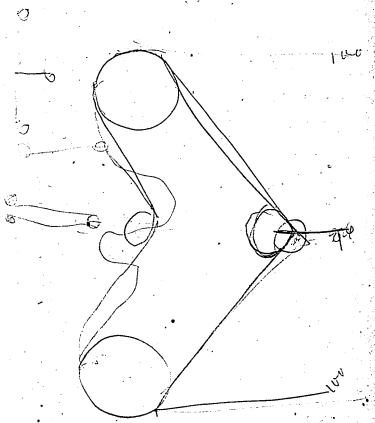
537
540

844
837
7

3½ in Wht

1143
35
5715

July 1st



124 July 1st

838 with commutator
1 1/2 magnetism

533
541

7

1143
1.5
5715
1143.
17145

1143
3.5
5715
3429
40005
.20000.

1143
2.5
5715
2858
2)28575
14287.5

July 1st 125

841 lbs belt off

841 lbs
836
5 lbs.
2 1/2

machine running free
Commutator on

2857.54 lbs
172450
28575
3029.950
3029 ft. lbs.

841 lbs
837.5
3.5

Commutators off

2000. ft lbs
106
12000
2120 ft. lbs.

The Shunt field current remains when running magnets open circuited open but commutator untouched brushes on.

33.000	4.5185	3029 ft. lbs
3029	3.4812	
	1.0373	

10.9 per H. P.

Under the same conditions but having the commutator brushes off it consumes

2120 ft lbs

33.000	4.5185
2.120	3.3263
	1.1922

15.5 per H. P.

The brushes require 909 ft. lbs.

3029	4.5185
2120	2.9586
909	1.5596

36.3 per H. P.

July 1 1879 127

Constants

E. M. F. of Daniells 1.08

Cu. Saturated solution Cu. Sulphate
Saturated solution Zn. Sulphate, amalgamated Zn.

I take the equivalent of one Weber over one Ohm as 44.3 foot lbs. These are the results of Rich Association

The half of the weight obtained on the scales must be multiplied by 1.06 to obtain the true strain in the belt.

Run 335 revs. July 1st

831 lbs. magnet with circuit closed

6.05 Webers in it

01 Deviation 52° 30' through magnet

75° 3 lbs. Circuit closed

Electro Dyn 6°

Total 8.1 Ohms

Estimate

$c^0 \overline{)19.192}$

4.5096 -5

2.4950

1.0146 10.3

831

753

78

3.9

July 1st

1143 3.0581

39 1.5911

4.6492

44.500 ft. lbs.

Estimate Current

10.3 1.0146

10.3 1.0146

comp 8.1 .9085

log 44.3 1.6474

4.5851

38.400 ft. lbs.

4.5851

4.6492

93.59

86 % Estimate

July 1st

5.5 .7444
5.5 .7444
19 7.9542
44.2 1.6464 — 1.6006
3.0894

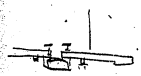
12 28
33.2 — 4.5155
3.0894
1.4291

26 magnets for H.O.

tan 45°

1.
9.3332
.1668

4.64 Webers at 45°



July 1st

To determine the constant of Tan. Galvo.

Two cells of Condit and Hanscom passed through Tan. Gal. and by shunt put through high resistance on which 5 cells of Daniells give 50 deflection

22° on Tan
30 on high res
over 1.88

3. .4771
1.88 .2742
10 9 .2032
.2403

1.59 Webers
for 22° deflection

9.5735
.2403
9.3332

12° 9' for 1 Weber

132 July 1st

52° 30'

0.1150
9.3332 -10
.7818

6.05 Webers

.7818
.7818
1.6006
3.1642
4,5185
1.3543

22.5 Magnets per H.P.

	9.3332	1 Webers	9.3332
	.3010		.6990 5 Webers
23° 17'	9.6342	2 Webers 47°9	10.0322
	.1761		9.3332 6 Webers
32° 52'	9.8103	3 Webers 65°	.7782
	9.6342	52°15	10.1114
	.3060		9.3332 8 Webers
40° 44'	9.9352	4 Webers	.9031
		59°5'	10.2363

50° Edison 5.3 Webers July 1st 1.33

5.53 Webers on field

.0761
9.3332 -10
.7429

758 lbs

178 = 5 17.8 Daniells

on 1.91 6° 10'

Total 8 Ohms

	17.8	1,2504
	1.08	.0334
Comp.	1.91.	.7190 −10
		1.0028 100.5 Webers

80.4 Volts

134

July 1st

535 rev.

Clearwater

10.05 — 1.00 28
10.05 — 1.00 28
8 — .90 31
14.3 — 1.6464
3.5551

Power 35.900 ft. lbs.

831 — 1143 — 3.05772
756 — 36.5 — 1.5623
73 — 1.06 — 0.02553
36.5 — 4.64448
44.100 ft. lbs. — 4.55351
.0897
.9103
= 81.4 %

490 revs.

July 1st

135

690 lbs running on its own field

840 running free

690
150 lbs 490 revs.

68.7 lbs run

284 = D

10° 27'

153 lbs.

136

July 1st

940 revs

25° 30'

940 revs

366 lbs

9.7 Ohms Total

840
366
474 lbs
237

237 2.3747
1143 3.0572
1.06 .0253
3.4572

286,000 ft lbs
330 880
4.5185
.9387

8.68 H.P

137

July 1st

6° 10'

9.0310
4.5155
1.0028
2.5127

page 133
Constant

2|9.6785
4.8392
2.5127
1.3265

21.2 Webers

1.3265
1.3265
9.7 .9826
49.3 1.6467
5.2820
4,5185 191.000 ft lbs
.7635

5.6 H.P.
6.4 H.P.

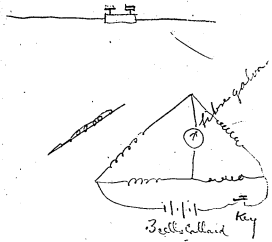
138. July 1st

4/64

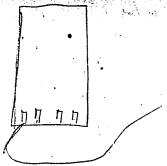
1.6

3

4.8 outside H.P



139



170 490 news. July 1 Rage 13.5

2 1153
765

1.8837
3.0825
4.7002
4.5155
92.500 .4577

2.26 N.P.

1143 feet on Lilt
80.6
1.06
4.9883

840 525 news July A1

679
161
80.5

1.9058
3.0825
4.9883
4.5-1.83
.4698
97.300
2.95 N.P

245 L
on 1.95 Ohms

11° 20
10° 40

9.1 Ohms Total

24.5 1.3892
1.08 .0334
1.95 9.7100 -10
1.1226 13.2 Water
1.1226
44.3 1.6464
9.1 .9590
4.8506
70.900 4.5-1.85
.3321

2.15

142

July 1st

525 revs

1143

80.5

1.08

31 0572

11 9058

1025

4.9883

1143

80.5

5715

9144

92.0115

1143

80

91440

571

92.011

143

July 1st

832 lb machine running

660

150 401

8,1 Total

290

over 1.87

832

660

172

86

148 2.2742

96. 6.208 0.7929

3.0671

1166. 3.0671

86 1.9345

1,06 0.0253

5.0269

106500

3

109500

29. 1.4824
1.08 .6334
comp. 1.87 91.7282
1.2240
16.75 8.1 .9085
2.1325
135 Volts 1.2240
44.3 1.6464
5.0029

100,000

5,0029
5,0269
.9760

700,000
87.5

8|94.70%
11 83
82.87% outside of question

9.4314
4.7157
2.5127
7.2030
1.2030
.9085
1.6464
4.9609

91.000
4.9609
5.0269
.9340

85.9% of constant of Dynamometer
10 74 to 2.5.127
75.16% outside of machine

5.0029
5.0394
.1635

92%.. If the reading on galvanometer was correct 92% of the power given to the belt driving the Edison was turned into electricity

89% if correction made for Tan 2α

65|230 (3
195
350

68)204 (3
204
260
264
560

July 1st results 147

In the morning made a concentrated solution Sulphate of Zn. found by experiment that acid must be added in small quantities to dilute solutions.

Arranged high resistance galvanometer so that five cells of standard Daniells, p. 127, could be thrown on the line by a switch made the deflection 50 or 10 for each cell, 5 cells in line.

Measured the distance of scale to galvanometer 680 mm length of scale = 65 mm

Tan 2α = 28/680 = .33 = 18° 40'.

720 scale divisions equal 460 mm
360 on a side

33 | 87.500 | 26
.56
215
198
7

2.6
6
15.6

Therefore there will be corrections to be made for the scale divisions on the galvanometer

156.1
2
312.2

4.3
2
8.3 correction

~~300 scale 292~~

360 scale divisions to 338 = tan 2α

at 338 correction 4.6 / 2 = 9.2

$\frac{324}{360} = \frac{169}{180} = \frac{56.3}{60} = \frac{338.1}{360}$

300
280

Tan galva with summer

For 360	dead	352	− 8
" 300	read	295	− 5
" 250		247	− 3

revs.	speed of belt	log
180	1117	3.0482 180
181	1126	3.0506 181
182	1131	3.0530 182
183	1137	3.0554 183
p.120 184	1143	3.0577 184
185	1148	3.0601 185
186	1154	3.0624 186
187	1160	3.0647 187
188	1166	3.0671 188
189	1173	3.0694 189
190	1179	3.0717 190

6.208

180 0.7929 × 2.2553 = 3.0482

181 0.7929 × 2.2577 = 3.0506

182 0.7929 × 2.2601 = 3.0530

1832 0.7929 × 2.2625 = 3.0554

183 0.7929 × 2.2648 = 3.0577

184 0.7929 × 2.2672 = 3.0601

185 0.7929 × 2.2695 = 3.0624

186 0.7929 × 2.2718 = 3.0647

1864 = 4

3.0671 + 23

3.0694 + 23

3.0717

Results July 1st

Revs. shaft 184 ten minutes
185
188

6.05 Webers on magnet

22.5 magnets for H.P.

Speed 535 revs Page 126

44,500 ft. lbs consumed

on total 8.1 ohms

The constant of the Inglis P.131

9.3332

535 revs Page 133

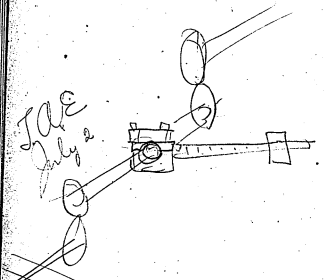
5.53 Webers on field

44,100 ft lbs given to machine besides the power required to drive the armature

35,900 in current 81.9%

80.4 Volts on 8 Ohms

940 revs 9.7 Total rev field
286 000 ft. lbs energy
8.68 H.P.



Two carbon lights
814.5 lbs ? running armature
727. circuit open
circuit closed 178

356 revs

185

1148

814.5
727
1875
43.75

1148
43.75
8036
3444
4592
50,167.6

33) 50,167 (1.5 H.P. ?
33
171
165
60

9375

2.3 H.P. about

154

.0761
9,3332 ⅛ 50° on Cir.
.7429
.7429
.91,9542
1.6464
3.0864

1,220 ft lbs on magnet

15 30 Volts
6

4.5185
3.0864
1.4321

26,4 Magnets for H.P.

Speed aloft. July 3. 1918

" machine open 525
" " closed 475

Wt ball off 92 oz
" ball on magnet open 9.14 lbs
" " " magnet closed
" " " circuit closed 955

Deflection High resistance 2.65
" Ohms 1.85 after 4 min
" Dynamometer 120°35' July 1917

Total resistance 8.1 after two min

Deflection Tan. Galva on magnet
Results H.P. consumed magnets
machine

H.P delivered
% delivered to consumed including friction
% existing friction
Volts

2.3472
1.9165
4.1647

82.8.

920
755
165
825

92.200 H.P. Consumed

.4476

2.79 H.P.

4.1647
1.065 .0274
4.1921 98.200 from the
4.5185 "
4736

2.97 H.P.

6 lbs
3 lbs due to armature 3.0482
.0274
.4771
3570 ft lbs 3.5527

26.5 1.4232
1.08 .0334
amps 1.87 9.7282 - 11
1.1848

15.2 Webers .9085
8.1 Cms
2.0933
124 Volts 1.1848
44.2 1.6464
4.7245
84.000 4.9921
.9324 85.6%

158

Wt 800 after coils heated.

Deflection high resistance 210

Deflection 10° 30'

Deflection ten on magnet 57

159

Speed shaft 178

" machine circuit open

" " circuit closed 490

Wt Belt off

Belt on circuit open 915

Belt on 4 magnets shunt 905

" " 4 circuit closed 785

787

Deflection High R 215

on Shunt = 1.52

Deflection Dynamometer 12° 6'

Total resistance 6.84

Deflection Tans. galvanometer magnet 62°-5'-30"

57° 0,1874

9.3332

.8542

.8542

1.9562

1.6468

3.3030

4.5185

2630. 1.20195

16 magnets for 4/0

160

21.2 1.3243
1.05 .0334
Comp 1.52 9.8182
1.1751

15 Webers
15. 1.1761
6.84 .8351
102 Volts 1.0112

1.1759
1.1759
.8351
1.6464
4.8333
68.100 ft. lbs.

178
6.208
65

2.2504
0.7930
1.8129
4.8563

915
785
130
65

71,800 ft lbs
4.5185
.3388
2,184 H.P

4.8336
4.8563
.9770
94.8%

74,800 4.8333
4.5739
.9594
91% as against pulley

178
6.208
60
66,200 ft. lbs.

2.2504
0.7930
1.7782
4.8216
4.8333
102

102%

162

163

Spark shaft
" machine circuit open
" " closed

Test of fall in resistance
130 39'
machine circuit closed

1		4	
20		20	
40	5.60	40	
		5	5.52
2		20	
		40	5.50
20	5.55	6	
40	5.55		
3	5.52		
20	5.52		
40	5.52		

1

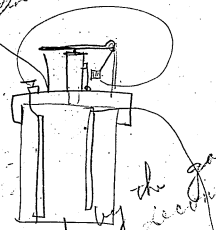
20 5.75
40 5.68
2
20 5.65
40 5.62
5.60
3 20 5.60
20
40 5.70 ?
!
3 5.52
20
40 5.52
4
20 5.51
40
5
20
40

0 5.90
20 5.75
40 5.65
1 5.62
20 5.60
40 5.59
2 5.57
20 5.55
40 5.54
3 5.54
20 5.53
40 5.53
4 5.52
20
40
5
20
40

5.90
5.57
.23
5.57

1.3617
2.7459
1.6158

4.10 ~~40~~ 40 to be added to the two readings



Regulation to act by the gases given off from the electric light-
given off from the cell.

at 550. ohms 100,000 foot lbs per min
Electricity given off
on 8 ohms

~~Horse power at 750~~

$550^2 : 750^2 :: 100000 : x$

2.8751
2.8751
comp 550 7.2596 - 10
7.2596 - 10
4.
4.2694

8 | 186,000 ft lbs
23,250
33 | 1627.50 | 49
132
307
297

4.9
6
29.4 lamps
at 8 ohms per H.P.

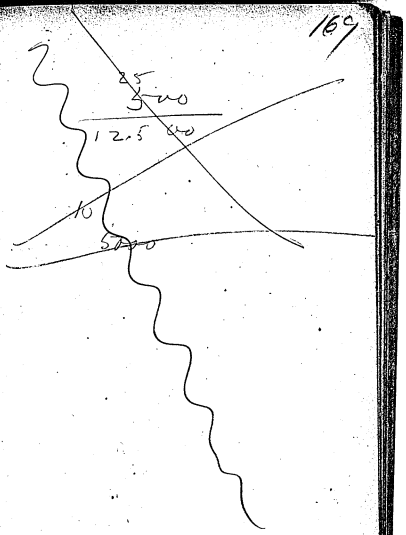
168 July 3

915
720
195
97.5

2 Carbon light

6.2 .7924
180 2.2553
97.5 1.9890
5.0367

108,000



169

170 Page 165 July 3

The resistance of the wire does not make as great a difference, since on the high resistance, Galvo, the resistance of the shunt increases proportionately to the resistance of the main circuit. But in measurements with the dynamometer this factor plays an important part, in that with the E. dynamometer as it is in that case the Webers are directly measured.

As the shunt, when removed cold has on a diminished resistance, the E. M. F. deduced from the high resistance, is greater than reality so that the constant on the dynamometer is smaller

July 3. 171

The constant of the dynamometer should be determined for low current and this would be found from testing

30 15
19
2.4

30/2.4 = 30 (12.5
24
60
48
120
120
0

1.0969
1.0969
1.0969
1.6464
3.7944
4.5185
.7241

6222

F. 23 per 1. R.

905 J

13010
.0752

118

13010
1505

Speed shaft 80
Stud machines 310

Wt when magnet and circuit open 905
Wt magnet closed 893
Wt " circuit closed 745
A. plating high resistance 135 .140
" low "
A. Electrum Dynamometer 6° 30'

Tan 5° 7'-8 50°

Total 6.8

Shaft 183 revs

Machine 342 revs

$\frac{171}{342}$

177

Without belt	924
With belt	922 1/2
Magnet	
On —	909
	913
Circuit closed	861

Deflection 144 = 0 on 149

Tan 62°

Total 6.85 6

178

924
881
63
31.5
106

3.05 54
1.4983
4.55 37
.0253
4,57 90 ft. lbs. consumed

35.8 ft. lbs.

Armature 14.4 1.1584
corrector for Volts 1.08 .0334
Coil Ohms 1.49 9.8268
1.0186 Webers

Ohms 6.85 .8357
.71.5 Volts 1.8543 Volts
1.0186 Webers
44.3 1.6464 equiv.
4.5193 ft lbs delivered
4.5587 " " consumed
.9656

92% as against magnetic off

179

913
861
52
26

3,05 54
1,41 50
4.47 04
.0253
4.4957
4,5193
4,47 04
01.04 91

1.12% as against magnet closed

4,51 93
4,57 90
.9403

87%

6 4,47 04
.0253
4.4957

180

Tests with Prony 181

Prony 1.281 lbs
3.333 ft. lbs

4.5 oz
16) 45 (281
32
130
128
20

20 inches
12) 40 (3.333
36
40

1.281 .1076
3.333 .5228
3.141 .4971 1.0199
229. 2.3598
3.4873
1076
3.3797

3070 ft. lbs

182

Edison 158 rpm

1.1665	3.0641	3.0815
2.5	.0278	
	.3979	
	3.4894	

3084 ft. lbs

3070

+ 18

183

2.9 — 3.3797

2.9 — .1624

3.8421

Prony

6951 ft lbs

1.1375 — 3.0815

6.625 — .8212

3.9027

Edison

7990 ft lbs

lbs — 3.0815 — .8451 — 3.9266

8440

184

Prony at 236 mm

236 .4624
.5228
.4971
2.3729
3.8552

716 2 36 for 238
8

185

33
33
16½

29 3.0915
#65 6.25 .7959
82.5 3.8874 ?
6.25

Edison 7540 3.8874
716 2 .7711
3.78

188

186

Edison

931.5
894.5
18260
913
912.25
1825 25
912.62

895 1/2
929
1824.5
912.25

929
912.62
1638
8.19

3.0415
.9133
3.19948
4.0048

101.000

187

Jenny

240
4,063

2.3802
.6088
1,0199 4.181
4.0089

6 | 1.00
.062
7.7949

10.200
9880
Int −3.20

58
929 Fictional

Ehrem.

853
900
1753
876.5

929
876.5
52.5

52.5
3.0815
1.7202
4,8017

2 | 6 3,9 0 0
3 | 1,6 5 0

6 4 8 0 0
324 avg
ft lbs ft lbs

To find out how many ft lbs
36650 4.5641 a weight
25.2 used
3.4213
1.1428

25.2 2.4014
1.0199 plus
3.4213

13.9 lbs should weigh

6 | 12 1/2
3 | 7 2/17
4 | 13 3/4
14.10 1/2 instead of 13.9

190

191

252

16 | 10.5 1.0212
16. 1.2041
.8171
.656

14.66 1.1662
252 2,4014
1,0199
4,5875

38.600 ft lbs

192

900
853
1783
8765

929
8765
2 5252
26.25

193

Edison

.188
.2625
1.065

3.0641
1.4191
.1027 4
.0915
4.5106

32.400

Penny

2.0
2
12) 40) 3.333

14.66 · 1.1662
3.333 · .5228
3.142 · .4972
252. 2.4014
4.5876

10.5
15) 105 (6.56
96
90
80
100
96
4

38,700

Penny

194

195

2 | 59
29.5

3.0641
.0274
1.4498
4.5613
36.400

95½
45
1435
11.7

129
71.7
2 | 5.88
29.15

3.0641
.0274
1.4636
4.5551
35.900

20
21
18.2
22
205
1017
203

529
203
87

4.4 lbs.

900
840
1740
870

889
954
1843
921.5

882.5
954
1836.5
918.2

888
956
1844
922

890
891
1841
920.5

3.0641
.0274
4.4

3.0641
.0274
.6435
3.7350

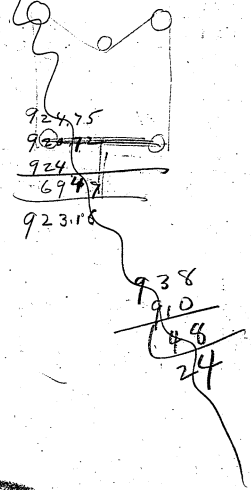
5430 ft. lbs. required to run the Edison

speed?

942.5
895
18405
920.2

945
904.5
495
9 24.75

200



929 Commutation off 201

924.75
2 | 4.25
2.125

3.0641
.0274
.3273
3.4188
3.0915

2620 ft lbs

Again Commutation off the Edison Spool 3.

3.0915
2.92
.4654
3.5569

898.5
943
184.1.5
920.72

Sum extremes of balancing

3600 Mean of 3

929
923.16
2 | 5.84
2.92

3.0915
2.5
.3979
3.4894

3080 ft lbs

924

202

948
891
1839
9195

8'92.5
941.5
18340
917.

929
917
12
6.

Edison commutation off 3

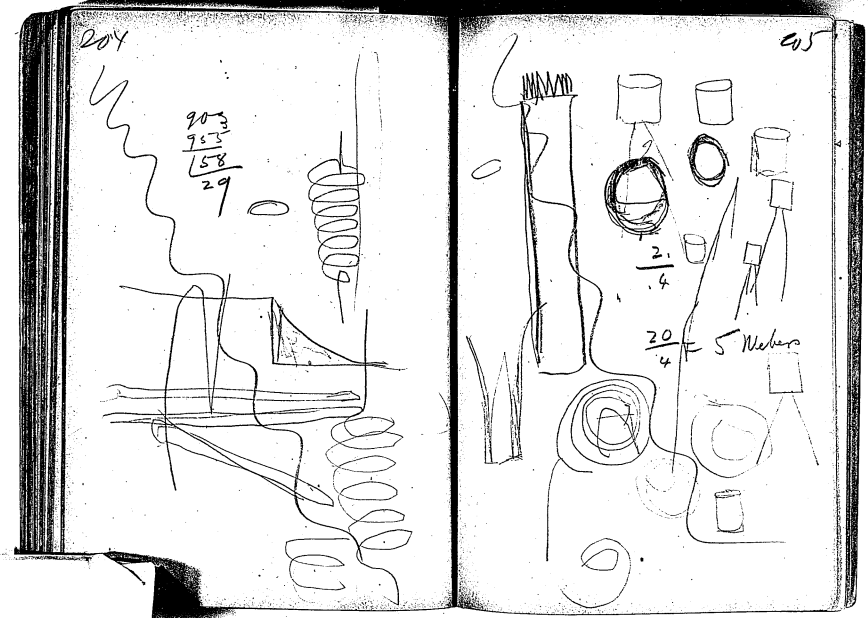
929
919.5
95
4.75

3.0915
.6767
3.7682

5860

3.0915
.7782
3.8697

7409.


204
205
2 0 3
9 5
5 8
2 9
2.
.4
20
.4
5 Meters

206

937.5
918
1855.5
√927.75

938 1/2
909 1/2
1848
√924

944.5
910
1854.5
√927.25

946.5
910
1856.5
√928.25

943.5
912.
555
√927.7

943
913
56
√928

940.5
911
515
√925.75

940
915
55
√9275

888
960
1848
922.5

943.5
913.
1856.5
√928.25

938.5
920.
585
92925

July 7 1879 207

average left off

92.4.
927.25
928.25
927.75
928.
925.75
927.5
928.25
927.75

929.25
927375

185 shaft of b shaft.
184 taken as mean

936.5 | 935 | 935 | 934
904. | 909 | 910 | 906.5
8405 | 844 | 45 | 405
920.25 | 922. | 922.5 | 920.25

935 | 934.5 | 934
906.5 | 908 | 908
415 | 425 | 42
92075 | 921.75 | 921

934 | 934 | 935
908 | 906 | 908
L | | 43
921 | 921 | 9215

Speed 1 dynamo 5-24
Circuit open and readjust on 5-24 revs
Speed shaft 183
184

184 means

920.25
922.5
920.25
920.75
921.75
921
921
921,5
9212.

927375
921.2 means
2 | 6.175 less
3.087

184 | 2.2648
6.208 | 0.7930
3.0578

1.065 | .0273
1143 feet 3.087 | 3.0851
.4896
3.5747

3757 ft lbs absorbed in
driven the dynamo.

4.5185
3.5747
.9438

8,99

210

.2473
9.3382 -10
.9141 8.2

.9141
T.9542 .9
1.6464
3.4288 2685

4.57185
3.42885
1.0897 12.2 Magnets for H.P.

24.5 23.5 33.5
2 4.5 2
37.5 37.5
√918.75 √918.75 √916.875

.315 30.5 29.5
√915.75 √915.25 √914.75

31
√915.5 915.5 914.5
28.5
914.25 913

The current is left at 2 11
and a current of 8.2 Webers
is thrown on the field, which gives
a deflection of 60.5° which gives,
57° after time

42.2 Magnets for H.P

Shaft 184 revolutions.
185

Machine

918.75	534 revs	
918.75	537 "	
916.75	927.375	
915.75	915.85	
914.75	11.525	lbs diffn
915.5	5.762	
915.5	3.0851	
914.5	5.762 .7606	
914.25	3.8457	
913		
915.850	7010 ft. lbs consumed	
	3757	
	3253	

from machine
with magnet

11/100 (90.909

99

100

99

1000

90.909

909.091

613:
475:
607:
607:
875

613

387 2.5877

613 2.1875

.8002

6.31 Ohms

125 .0969

875 .9420

.1549

1.44 Ohms

31st Circuit closed, machine running 537 revs with 57° deflation from current on magnet

The Elec. Degree 100

The high resistance around a shunt of 1.44 Ohms gave a deflection of 20° or 20 Daniells. The total resistance being 6.31 Ohms.

20 1.3010

Comp 1.44 9.8416 -10

1.1426

6.31 .8000

1.9426

98.3 Daniells .0330

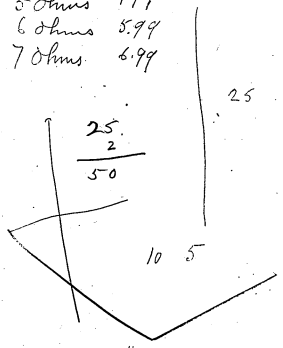
1.0256

106 Volts

Test of Wire in Bridge This for a sliding arm

ohm 1	1000.0 / 911.5 / 88.5	ans .971	88.5 / 911.5	1.9469 / 2.9597 / 2.9872
2	1000.0 / 835.5	ans 1.97	164.5	2.2161 / 2.9217 / 1.2944
3	1000.0 / 771.25 / 228.75		228.75	2.3592 / 2.8873 / .4719
4	1000.0 / 716.5 / 283.5		283.5	2.4525 / 2.8525 / .5973
5	1000 / 668 / 332.		332.	2.5211 / 2.8248 / .6963
6	1000.0 / 625.5 / 374.5		374.5	2.5735 / 2.7967 / .7778
7	1000 / 588 / 412.		412.	.6149 / 1694 / .8445

1 Ohm	.971
2 Ohms	1.97
3 Ohms	2.965
4 Ohms	3.958
5 Ohms	497
6 Ohms	5.99
7 Ohms	6.99



47°

.03034
9.33322
.6971
.6971
1.95-42
1.64 84
2.7948
20

4.98

.623 H.P. lbs

45
4.35
4.26
827.5

455
455
3275

20
45
75
375

19
43
4.26
31

18
475
455
32.75

18
475.
455
32.75

2.35
50
735
3.675

27
50
77
3.6

21.5
50
71.5
35.75

20
47
67
35.5

4.5185
2.7948
1.7237

52.9 Magnets for H.P.

On the magneto 4.98 Webers
that is 47° on the
46° 30'

Use the High Resistance galvo
gave 17.7 D mill on 1.44 Ohms
17.6

Speed of main shaft
186 revs.

8° 4' on Elec Dyne

596
874
604
894
908
698
910
700

829.25
832.75
375
31
832.75
832.75
36.75
36
35.75
36.5
835.40

927.82
874.3
2 | 53.53 lbs
46.176

.18

3.0624
.0273
46.76 1.6702
4.7599

57510

126 2.1004
874 2.9415
.1589

600)400(
.660
1.44

17.7 1.2480
Comp: 1.44 9.8411 - 10
1.0891
6.66 .8239
1.9130

81.8 Danielle in circuit

1.079 .0330
1.9460
88.6 Volts 1.9460
9.1761 - 10
3.0681
44.3 1.6464
4.7145

51,800 ft. lbs given back

57,510 ft. lbs required to drive the machine

Total 6,664 Ohms

.7145
4.7599 Inclusive friction
.9546 90%

57510
3757
53753

4.7145
4.7304
.9841
Exclusive friction
96.3 %.

220

221

$\frac{26^{\circ}4}{2}$

508 revs

44° 30' on Magnet

43° 32

Daniells on Ohms

508 revs.

508 revs

43° on magnet

16.2 Daniells on Ohms

Total

694

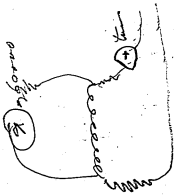
908

698

910

700

222



668
382

223

$$
\begin{array}{r|l}
332 & 668 \\
 & 664 \\
\hline
 & 400 \\
 & 332 \\
\hline
 & 680
\end{array}
\qquad 20.12
$$

$$
\begin{array}{r|l}
243 & 767 \\
 & 729 \\
\hline
 & 280
\end{array}
\qquad 31
$$

$$
\begin{array}{r|l}
248 & 752 \\
 & 744 \\
\hline
 & 800
\end{array}
\qquad 30.3
$$

$$
\begin{array}{r|l}
1635 & 8365 \\
 & 8175 \\
\hline
 & 190
\end{array}
\qquad 51
$$

224

Aug. 8, 1879.

Large Edison, 20 ohms, driving small belted Edison with 0.6 Ohm in armature 1.6 in field 2.2 Total

3.0 on dynamometer

Tests. 1st Insulation of direct high resistance Galv.

2nd Connecting wires in bridge

3rd ~~Rotation~~ Armatures and magnets on both machines armatures in all positions.

4th the Constant of Tan G. al in the place it is given. Instrument is now thought to

225

and the Shunt. This is the sine of deflection for 1 Weber

5th Constant of Dynamometer. This is the square root of the deflection for 1 Weber.

Then test the E.M.F. at various speeds with large resistance, and strong magnets

The same large resistance and varying strength of magnets at medium speeds say 500 or 600 revolutions

Then with strength of current on magnets such that 150 Volts may be obtained at 600 revs about diminish the resistance and measure the E.M.F.

2.4 Constants of Instruments

111 / 50 × 5 Daniells in Shunt

over 2.04 ohms

11.1 Daniells

Connections not examined

11.1	1.0453	
1.08	0.0334	
comp 2.04	9.9904	
	.7691	

587 Webers

44° 30' tan

tan 44° 30' = 9.9924
.7691
9.2233 9° 30'

The tan. placed near some masses of iron which change its constant

9.9924
7957
9.1972

Elec Dyne Constants

1° 30' = Def (1)

air 1° 30'

8.4179
4.2089 −10
.7694
3.4398
2.4398 = Constant

8.4179
4.2089
.7952
3.4137 Constant
2.4137

$\frac{11.5}{50} \times 5$ (1)

2.07 − .08 = 1.99 Ohms

Connecting wire .08 Ohm

Insulation to high resistance
300,000 Ohms or more

	11.5	1.0607
	1.08	.0334
Comp	1.99	9.7011 − 10
		.7952

6.24 Wicks

(2) Tan 42° 30"

= 9.9620
7664
9.1954 cosulan

(2)

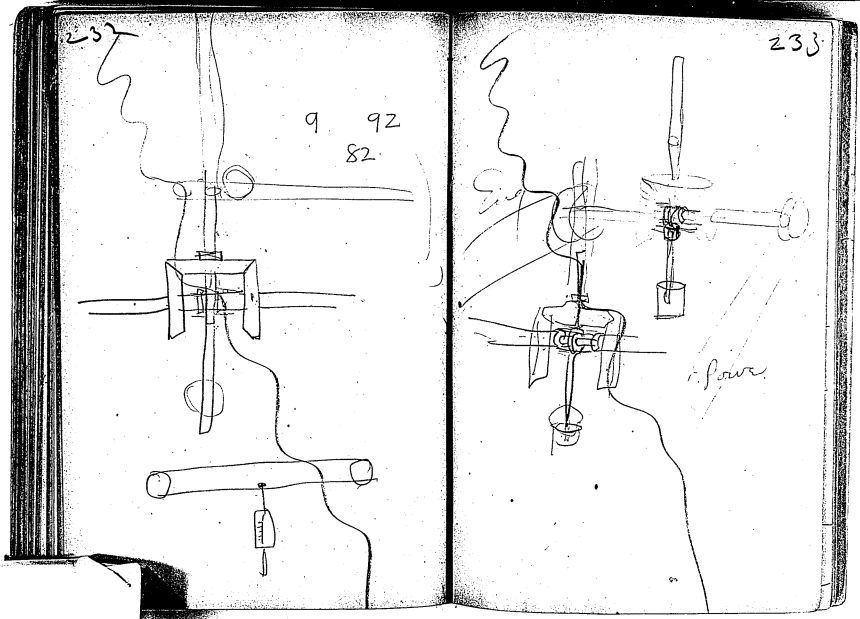
1° 16'

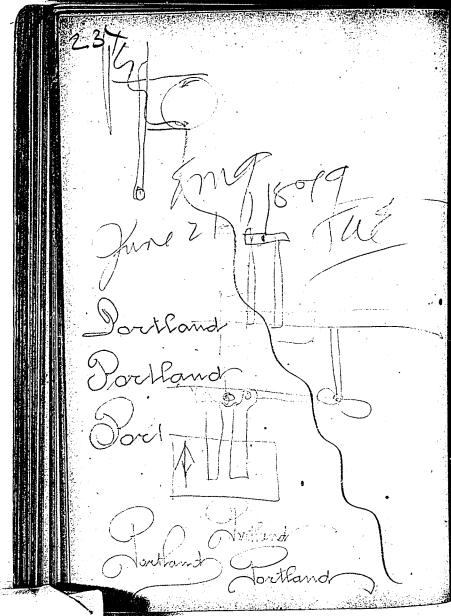
8.3415
4.1707
.7664
2.4043 cosulan

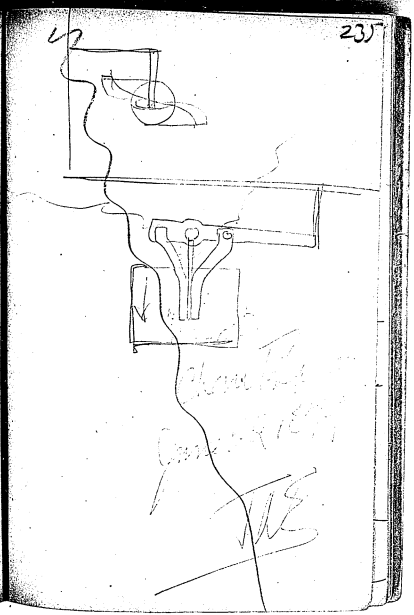
10.6 Daniells (2)

10.6 1.0253 2.04
1.08 .0334 8
Comp 1.96 9.7077-10 1.96
.7664 5.84

page 246


232
9 92
82
233
Sig
i. Soure


June 21 1899
Portland
Portland
Portland
Portland
Portland



Plan of tests.

Errors in last tests to be avoided

1st heating of coils and not measuring quick enough after the current has ceased passing.

This may be in a great measure avoided by using the new coils in multiple arc. 50 coils $\frac{3}{5}$ Ohms each.

This will allow in multiple arc of 3, 16 Ohms in multiple arc of 4

$$\frac{3}{4} \times \frac{50}{4} \frac{25}{2} = \frac{75}{8} = 9.40 \text{hms}$$

For testing on about 237 connect them in multiple of five

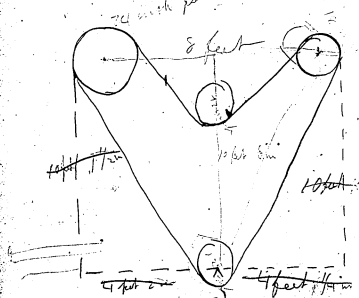
$$\frac{3}{5} \times \frac{50}{5} = 6 \text{ Ohms}$$

$$\frac{3}{6} \times \frac{50}{6} = \frac{25}{6} = 4.2 \text{ Ohms}$$

Arranging the coils in this manner the heating effects should be very small and may be neglected if the measurement of the resistance is taken immediately after the current stops.

The current should then first passed through the coils and at the speed which is required from the machine and

an approximate estimate made of the resistance in the circuit so that when an exact measurement is required it can be more quickly made knowing about what to expect



The Edison Dynamometer

$\frac{\text{Weight taken off}}{2} \times \text{Speed of belt} \times 1.065 = \text{foot lbs}$

High Resistance around Shunt make. shunt. so that it will heat very little then readings can be made without changing it and its resistance be taken as constant; about two Ohms will be right.

Rule divide the deflection obtained by the deflection from the Standard Daniells multiply by 1.08 to reduce to Volts. divide by Ohms in shunt to find no. of Webers multiply by the resistance in total circuit to obtain.

$C = \frac{\varepsilon}{R}$

$R = \frac{\varepsilon}{C}$

$\mathcal{E}^2 R = \varepsilon C$

Volts. Then multiply the Volts by the Webers and by 44.3 to obtain the no of foot lbs. in circuit.

Observer ~~Mr~~

Weights 1st Running belt to machine off

2nd Belt on magnet not made

3rd Belt on magnet made

4th Belt on circuit closed

Deflection of high resistance

Resistance in Shunt 240
in total circuit
see if commutation starts

Magnets
Deflection on tan. Galv.

24 Correction for hills

Page 238

10-9

10

127.5 inches

24.

251.5

125.7 average

50 inches

48.25

9825

49.12 average inches

125.7 — 2.0993 — 3 — 4.1986

15790.

49.12 — 1.6913 — 3 — 3.7826

2413

15798

18203. — 4.2602 — 2.1301

1349 — 2.0993 — .0308 Correction

1075

Page 109

6 feet 3 in

6.25 feet

180	2.2553		
6.25	.7959		
1.075	.0308		
	3.0820		
2	.3012		
480	2.7808	6040	1/2 shed
	24		
181	2.78234		
	24		
182	2.78258		
	24		
183	2.78282		
	23		
184	2.79054		
	23		
185	2.79328		
	23		
186	2.79551		
	23		
187	2.79774		
	23		
188	2.79997		
	23		
189	2.80220		
	23		
190	2.80443		

2xy

246 page 201

$\frac{132}{.50} \times 5^-$

13.2	1.1206
1.08	.0324
1.98	9.7033
	.8573

$\frac{206}{1.98}$

Sin 2° 8′

85708
4.28554
.8573
2.4281

tan 48° 45′

.0570
.8573
9.1997

1. 90

247

$\frac{7.2}{50.} \times 5$ amps

7.2	.8573
108	.0324
#97	9.7055
	.5962

$\frac{205}{8}$
$\frac{}{19.7}$

3.95 Watts

tan 34° 30′
34° 15′

9.8344
.5962
9.2382

248

45 Danielles
1.08 .65532
1.96 .02134
9.90777
.3943

204
8
1.96

22° 30' 9.6172
.3943
9.2229

249
205

5.4 .7324
10 8 .0334
1.97 9.7055
0.4713

26°30' 9.6977
1.4713
9.2264

3.8 5705
1.08 .0334
1.98 9.7077
.3209

19° 30' 9.5490
.3232
9.2232

.75	8751
108	.0334
196	9.7077
	.6162

34° 9.8289
.6162
9.2127

Tan. list.

9.2127
.2282
.2264
.2229
.2282
11.1284
9.2256 9° 32'

Elsie Dynes

.4043
14137
.4281
11.8461
2.4154

252

270 revo
275 revo of machine

34° 30'
33 30.

9.8371
9.2256
.6115

4.08 Webers on magnet

408 .6115
.6115
443 1.6469
218694

740 ft lbs on magnet

4.5185
2.8694
16491

44 magnets for H.C.

253

5.8 .7634
1.08 .0334
Amp 7.12 9.1475
9.9443
T.9443 .879 Webers

66 Ohms total

T.9443
66 1.8195
1.7638

5.8 Volts

44° 30'

44° 15 9.9886

10.9 1.0374
1.08 .0334
2. 9.9990
0.7698 7.41

16.0 1.2041
1.08 .0334
2.02 9.6946
.9321 8.55

Elec. Dyne

1° 20'

(8.3664
4.1834
.7698
2.4154
5.1829 0
=

3° 15' 8.7585
4.3792
.932
2.4154

256

40° 18' | 8.8749
4.4374
.9856
.4484

18.4 | 1.2648
1.04 | .0334
2.04 | 9.6904
.9886

4° 28' | 2 | 8.8914
4.4457
.9975
1.2695
.0334
1.04
2.02
9.6948
.9975

2.4482

257

10.0 | 1.0334
1.08 | 9.6946
.7240

1° 16' | 8.8345
.1728
.7240
1.4548

12.1 | 1.0825
9.7280
.8105

05.0' | 8.5055
.4158
.7247

258

$\bar{1}.4136$
.4446
.4488
.4482
.4542
.4417
.2511
$\bar{2}.4419$ Constant of Dynamo. Elec.

.9904
.9904
44.21.6464
92 $\bar{1}.9638$
3.5916 3900

4.5185
3.5910
.9275 846 per H.P.

Edison No. 1 Magnet. 92 Ohms
Armature 1.03 2.07
4° 12' 18.8647
$\bar{1}.4323$
$\bar{2}.4419$
.9904

9.78 Webers on magnet
275 Revs.

9.1	.9590
10.85	.0334
11.2	8.9508
	9.9432
	$\bar{1}.9632$ .858 Webers

66 Ohms 1.8195
$\bar{1}.0232$
1.7927
57.9 Volts

Rev 35-8 revs

115

$\frac{115}{91} \times 57.9$

1.7627
2.0607
8.6410
1.8644

73.2 Volts

529 Revs.

$\frac{165}{91} \times 57.9$

1.7627
8.0607
2.2175
2.0409

109 Volts

Edison No. 2 - 261

Magnetic 1.42 Ohms
Armature .56 Ohms
.58 Ohms

3° 18'.

8.67 Webers

.9382
.9882
1.6434
.42 .1523
3.6721

4.5185
3.6721
.8464

262 334 No. 2 Edison revo

Daniells

11.1

8.88	.9128
1.056	.0234
11.1	8.9547
	1.9059

.796

.80 1.9031
1.9009
1.9040

6 3 Volts

504 revo

243

128
8 X 6 3

1.8040
8 .0872
128 2.1072
1.9168

99.6 Volts

264

748 revolutions

183 / 68 = 6 S

1,8040
8.3872
2,26225
2.15517

14.1 Volts

1005 Revo

240

1,6040
8.3872
2.3602
2.2714

186 Volts

Changing the [illegible] 265

195 revo.

6° 19'

2/90415
4

The machine "hunted" Probably the cord around the armature caught in one of the pole and [illegible] it was so at 1:30 P.M. the test ceased. The [illegible] were made for [illegible]

Sewing machine Motor

Magnet 6.9 ohms Now 5.8 Ohms!

Armature 3.9 Ohms

Armature

3.9 . . .
2.85
1.85 cross
2.3
3.97
4.72
5.2
5.5 Cross
5.45
5.1
4.42
2.75
1.52
.85
.85
2.27

The armature cotton 267
off and the coils separated
from the commutator
Two cross joint. Again con-
nected and tested out in which
the wires came. Two shorts
Crossed each other beneath
the commutator insulated
all right Resistance of
Armature = ~~5.8~~ 5.12
5.26

Lunny Machine Works Sept. 5.

37° on tan

speed 2200 - 2500 running free.

2 volts on resistance of 6.2 Ohms 4/2 wires

6.08

300 C.P. / 26 Bos × 5 Daniells on machine motor

2.9	.4624
6.08	.7839
.499	T.6785

300	2.4771	
comp 26	8.5850	
5	.6990	
	T.7611	57.69 Dan
1.08	.0334	
	1.7945	62.3 Volts

27 = 5 Daniells

255 total motor

5-4 volts on motor

50 over 5 Dan

10 volts

.499	T.6785
.499	T.6785
6.08	.7839
44.3	1.1454 61.24
	1.7863

61.28	1.7873	
62.3	1.7945	12.6
comp 2.9	9.5316	
	3.1194	

45185 / 3.1194 / 13991 · 1/25 Horse power

13.11 H.P.

for total

270

Magnet 6.9
Armature 5.26
12.16

6.08 : 12.16 :: 61.26

61.26 1.7867
12.16 1.0848
Comp 6.08 9.2161
2.0876

122.2 ft lbs in resistance of machine

1311
122.2
1188.8 ft. lbs in work

~~3.0749~~
4.5185
3.6799
1.4386 2714 per H.P.

Motor running true.

271

10 : 1
6.08 : .7924

0.2076 1.61 Watts
6.2076
.7924
49.2 1.6464
2.8540 714.5 ft lbs

10 : 1 :: 714.5

2.8540
1.7076
9.
3.5616 3614 ft. lbs.

12.16 1.0848
Comp 6.08 9.2161
714.5 2.8540
3.1529 1433

3614
1433
2181 ft lbs

4.5185 1
2181 / 3.13387 1 H.P.
1.1798

272 The large Edison mot.

Cos 37° 9.8771
Log 12° 15' 9.3367
1.5404
3.4 1.5404
44.5 1.64644
1 9.95542
2.7218
527 ft lbs
3 Webers 4.5185
2.7218
1.7967

Sewing machine motor No. 1
Oct. 21 1879.
Magnet 5.7 Ohms
Armature 5.1
10.8
Total 10-9
25 Coils

273

Sewing Machine Motor No. 1

The large Edison with 3.4 Webers in the field
527 ft. lbs.
62 magnets per H. P.

The motor has
Resistance 6.9 Ohms magnet
5.26 Ohms armature
12.16 Total

In circuit with the motor as placed 6.2 ohms
11.2
6.08 ohms

An E.M.F of 2.9 Volts was found active on this when motor was running free
2.9 .4624
6.08 .7839
.6785 .477 Webers

.477 Webers circulating

Motor running free
Around the machine was 271
found an E.M.F of (as per log)
62.3 Volts.

On the 6.05 Ohms resistance
with .477 Webers circulating
61.28 ft lbs. are given
off per minute

The the fall in Emf over
the resistance, is to the fall
in Emf around the machine
as the work given off from the
resistance is to the work given
off by the machine

.2.9 : 62.3 :: 61.28 : X

X = 1317 ft. lbs
That is the total amount
consumed in the machine.

1.7945
1.7874
9.5376
3.1195 1317

.7868
1.7874
9.2171
1.7913 6%

4.5185
3.0772
1.4413

1194. 3.0772
1317. 3.1195
.9577 90.7

Resistance 6.08 Ohms
Motor 12.16
Machine 1.
19.32 1.2861
.1477 1.6785
.9646

Motor running free

The amount consumed by the resistances of the machine would be proportional to sum of resistances

6.08 : 12.16 :: 61.28 : X

X = 122.56 ft. lbs

1317 / 122.56 = 1194.44 ft lbs consumed in work

1 / 27 H.P

90.7% of the energy entering the motor is turned into work

The E. M. F. active in the circuit is the product of the total resistance and the current

That is 9.2 Volts

62.3
2.9
.147
6567
9.2
56.47

1
amp 6.08 | 9.2161
0.2161
0.2161
.7839
1.6464
2.8635

Motor running free
The centrary E.M.F. of
motor at 2200 - 2400
about 56 Volts

2nd Exp. The wheel of the
motor held as in first
position on it and make
it do ~~one~~ more work;
page 269 10 Volts across 6.08 Ohms
$\frac{10}{6.08} = 1.64$ Webers
circulating or 730 ft. lbs
per 6.08 Ohms.

730
51
730
3650
3723.0

5185
3.5694
.9491

1/9

2263 | 3.35-41
3723 | 3.57105
.7836

4.5185
3.35-41
1.1644

around motor 51 Volts

Then 10 : 51 :: 730 : X

X = 3723 ft. lbs total on motor.

6.14 : 1 :: 730 : X
2
1460

X = 1460 on motor

in motor

∴ 3723
1460
2263 ft lbs work in motor

60 % of power entering motor given off as work

1/4 of a H.P given off as work

19.32 1.2861
1.64 0.2161
1.5022

61
1.64
62.6
3117
31

Active E.M.F.
about 31.7 Volts
Contrary E.M.F.
about 31 Volts

84 No field no current.

3029 ft. lbs.
to run machine with
commutator on
page 125

2.120 ft lbs
to run machine with
commutator off.

$\frac{41}{2}$ $\frac{514}{2}$ $\frac{257}{2}$ $\frac{128}{2}$

18' 6.25

20 X 1175 X 1.065 =
2350 20
23500 X 1.065 = 25027.

log	44.3	1.6464
log	1.08	0.0334
log	1.065	.0273

2.0000
1001

Menlo Park Notebook #78 [N-79-12-27]

This notebook covers the period December 1879-February 1880. At the beginning of the book is a series of notes by Edison on magneto machines and conductors. The rest of the book was used to keep a record of lamps in the laboratory. The entries are probably by Albert Herrick and include a drawing showing the layout of the lamps in the main laboratory building. The label on the front cover is marked "Herrick" and "Account of Lamps." Except for the first page (p. 3), the book is unpaginated. Approximately 125 pages have been used. Some pages have been torn out of the book.

No. 78

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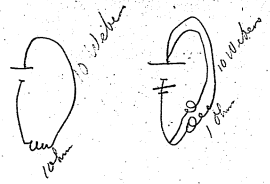
June 1, 1896.

3

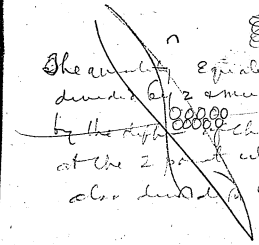


If you double the radiating surface of the Induction Coil on a magneto machine the temperature will be reduced ~~3/4 of~~

That is to say if a given magneto machine has a radiating surface of two square feet & on a given resistance reaches a constant temperature of 200, then if the size of the coil be increased to 4 feet surface the temperature will only reach 150 or in other words it will not rise

about the atmosphere,

The friction of the molecules is the cause of the heat from a wire when a current is passing ... waves of energy tend to ... the molecules' motion ... friction is heat.



The ... equals the square ... by 2 and multiplied by the ... of the pulse ... at the 2 point which is ... 6/7.

Good Conductors such as Copper have their molecules oriented easily hence small amount of heat energy evolved by friction & ~~the Current~~ when current passes. & work is not done except at slight extent in Orientation, but with Crystalline Conductors a large amount of work must be done to Orient the Molecules & great heat is given out hence these Crystalline

bodies are poor conductors
The crystallic adhesion or
force tends to resist
Orientation,

It is probable that the
best thermo piles will be
those whose
molecular newest orientation
by electricity the most,

The energy absorbed in any
Magnetic machine
will be at the square
of the diameter of the
Bobbin the shaft speed
Remaining the same -

12 | 22 | 22 | 10 | 11 | 11

2 3 | 2 | 3.00

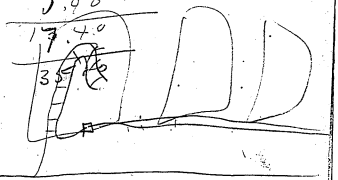
3 4 | 2 | 3.140

4 5 6 | 2 | 3.00

7 8 | 2

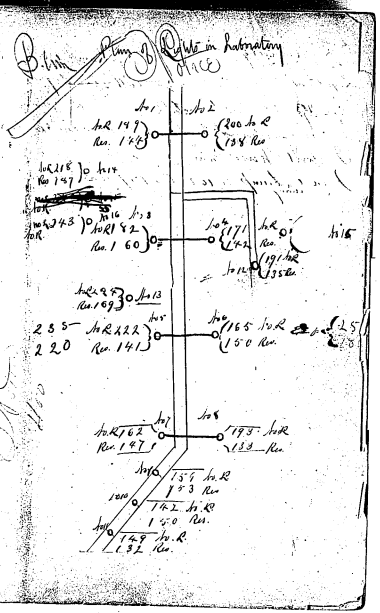
90) 201 (2 2.3
150
210
180
300
270
112
1008
896
112
12.376
5.40
17.40
35.76

108
5
140



Record of Pumps in Laboratory

Date	Motor Compressor running	Motor Oil Pump running	Total time running	Number of Pumps running	Remarks
	hour min	hour min	hour min		
Dec 27	9 00 AM	12 00 PM	2 10	two	9 10 11 12 13
" 27	1 03 PM	4 20 PM	3 17	two	9 10 11 12 13 14 15 16
" 27	5 30 PM	9 00 PM	3 30	two	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
" 27	11 40 PM	11 56 PM	16	two	10 11 12 13
" 29	5 00 PM	9 45 PM	4 45	two	9 10 11 12 13
" 29	5 20 PM	9 45 PM	4 25	two	1 2 3 4 5 6 7 8 14 16
" 30	9 46 AM	11 05 AM	1 20	two	1 2 3 4 5 6 7 8 9 10 11 12 15
" 30	11 25 AM	11 00 M	35	"	" " "
" 30	1 01 PM	1 55 PM	5 50	"	" " "
" 30	6 00 PM	8 55 PM	3 53	two	1 2 3 4 5 6 7 8 9
" 30	8 66	10 00	6 48	two	14 15 16 10 11 12 13
" 31	3 22	10 05	6 43	two	15 16 9 10 11 12 1
" 31	5 12	10 05	4 07		1 2 3 4 5 6 7 8 9 10 11 12
Jan 1	5 30	9 30	6 48		1 2 3 4 5 6 7 8 9 10 11 12 13 14 16
Jan 2	9 25	12 00	2 35		1 2 3 4 5 6 7 9 10 11 12
Jan 3	1 15				


Plan of Pump Room in Laboratory
No 1
No 2
No 3
No 4
No 5
No 6
No 7
No 8
No 9
No 10
No 11
No 12
No 13
No 14
No 15
No 16
No 17
No 18
No R 147
Res. 148
No R 218
Res 147
No R 143
No R 142
Res. 160
No R 222
Res. 141
No R 162
Res. 147
No R 155
Res 153
No R 142
Res. 150
No R 148
Res. 152
No R 200
Res 138
No R 171
Res. 142
No R 191
Res. 135
No R 165
Res. 150
No R 195
Res. 139
No R 235
Res. 175
No R 297
Res. 169
235
220

Dec. 27

Laboratory. Lamps No 1 to Lamp 189 Res 144

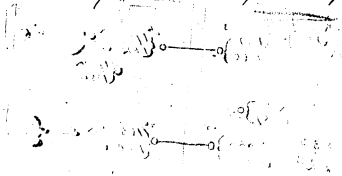
Light at light at 5:30 cutt off at 7:00

Dec 28 Burned still 9 o'clock this

A.M. also exchanged for a better cutter by

I don't know who

I am using Lamp No 162 Res. 147 in its place



Dec 27

Laboratory. Lamps No 2 to Lamp 200 Res 158

Light @ 5:30 cutt off @ 7:00

Dec 28 Cross in Crucible taken down 10 am

Rep by Ns Res Dec 30 R

Jan 1 burning Lamp No 193 Res 182

Laboratory Lamp No 3 No Lamps 152 Res. 16
Light @ $.30 cut of at 9.00

~~Jan 1 nights~~
Jan 7 "
Jan.

Labora Lamp No 4 No lamps 171 Res. 142
Light @ 5.30 cut of at 9.00 P.M.

Laboratory Lamps to 6-40 Lamps 2241 Rec 141
Light @ 9.30 cut off @ 9.00

Laboratory Lamps to 6-40 Lamps 165 Rec 150
Dec 27 Taken down stairs replaced by Lamps to 254 Rec 150 Light @ 8.30 cut off at 9.00

Dec 26 Laboratory Lamp No 7 to light 162 Res. 147
Light at 5:30 cut off at 9:00

Dec 27
Laboratory Lamp No 8 to light 173 Res. 136
Light at 5:30 cut off at 9:00
Taken the 1 Jan 1880.

Dec 27 Laboratory Lamp No. 9 Wright 1.17 Rec 1.93

Commenced burning @ 9.50 Dec 27 A.M.

Stopped @ 9.52

Dec 29 Commenced " " @ 11.40 " 29 "

Cut off at 11.50

Dec 27 Laboratory Lamp No. 10 Dyd-No 142 Rec 1.80

Commenced burning @ 2.50 Dec 27 Afte.

" " @ 11.40 " 29 "

Laboratory Lamps No 11 No Light 149 Res 192

Commenced burning @ 10.50 Dec. 27 A.M.

" " @ 10.40 " 29 " "

Cutt off at 10.50 " "

Broke on the night of the 31st Dec 9.40 P.M.

Not replaced Jan 2 1880

Laboratory Lamps No 12 Lamp No 191 Res 193

Commenced burning @ 10.50 Dec 27 A.M.

Cutt off @ 12 " "

Dec 29 Light @ 10.40 cutt off @ 10.50.

Laboratory Lamps No 13 Lamps No 224 Res. 169
Commenced burning @ 10.50 Dec. 27 A.M.
Commenced burning 120 Taken by Francis
Rep by No. 235 Res 220 28 inst.
Commenced burning @ 9.40 Cutt ~~Aft at 9.30~~
Dec 27

Laboratory Lamps No 12 Lamps No. 214 Res 157
Commenced burning @ 10.50 Dec. 27 A.M.
over work-bench Taken on the 28th and
replaced by
Dec 29
No Lamps Lamps No 15 was put in its
place for the evening
Dec 30
No Lamps 9 A.M.
Entered for Lamps 168 Res 171
No Lamps Jan 2 1880

Laboratory Lamp No 15 Lamp 240 Res

Commenced burning 10 5 0 Dec 27 09 Hr.
ooa work bench No Resistance Given
Taken on the 28th Dec. and replaced by
changed for 256 Res. not given
put in lamp No 14th plane
Dec. 30 No Lamp [illegible]
plane 2 hrs 15 M when left up for
good
Changed number for the one in
Water on table

Laboratory Lamp No. 16 Lamp no. 243 Res not known

Commenced burning @ 10 5 0 Dec. 27 09 Hr.
ooa work bench No Resistance Given
Taken on the 28 and replaced by
Exc. for 251 Res. not given.
Dec. 30 No Lamp not known 254 Res 180

12	84	5-6	78		
			all night		
768 9	9	9	9	9	Jaundice
000		811	110		
12 00	98	98	98	98	
780 a	98	98	98	98	
1200	98	98	98	98	
12 00	000	00	00	00	

Noticed 000

350 Jaundice

Noticed that there was a break

Next where the skin of the umbilicus

decreased

into the mesenteric

Next the finger into the

direction of [illegible] A-B The

direction the effect

and the finger into the

and examined [illegible]

broken

No Comp
100
101
102
103
104
105
106
107
108

2655 Second chronometer made
Dilke
Communicated | Jan 2 1810
by Capt al- | noon
Day | hours

Jan 31 6.5.6
Jan 31 22.10
Feb 1 6.10
2 5.10
3 5.10
4 10.10
5 6.10
6 22.10
7 22.10
8 22.10
9 11.10
100

100 Bs 1264 Money Invested before Insolvent

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108 Rec. 141 Page 21 Brussels Book: N° 1445

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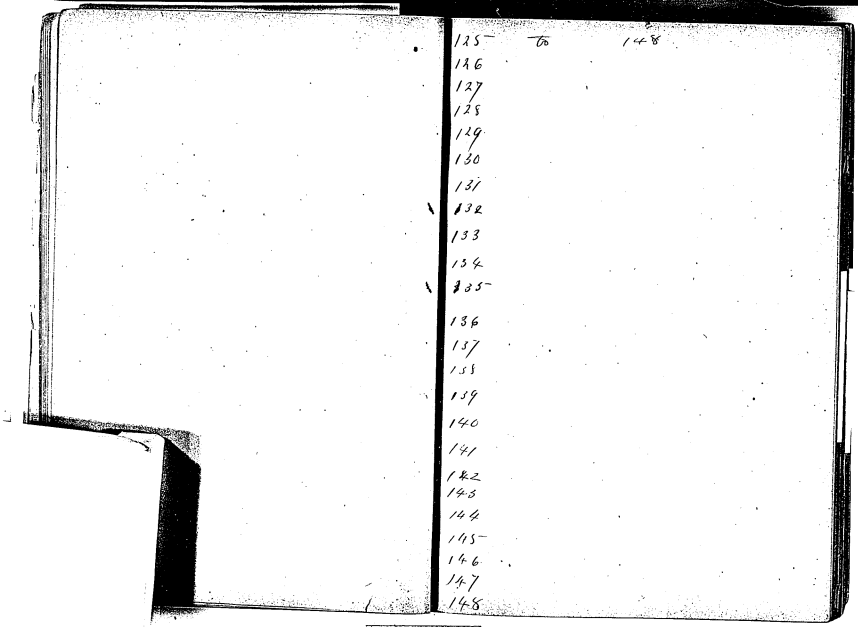
125 – to 148
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149 to 171

Revised and
index made

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151

152

153 Rec 132 Page 28 Brussels 406.13

154

155 Rec 126 for page 4 Brussels 562.14

156

157

158 Rec 137 Page 8

159 Rec. 153 omits. on page 1 Brake 683.45

160

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162

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164 Rec. 182 page to be

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167

168 Rec. 147 Page 29

169

170 Rec 157 Page 29

171

172 Res. 135 — page 7 items brought before Council
173
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175 —
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181 Res. 182 Page 31 Brussels 429
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184 Res 145 — Page 57 — Brussels 348
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197 Rec. 145 Page 33
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201 Rec. 147 page 5
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222 to 250

223. Rec. 140 on page 3 Brutell Jean Baptiste 867

224. Rec 109 Page 25 Brutell 227

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270 Rev. 140 Longest Jump Page 9
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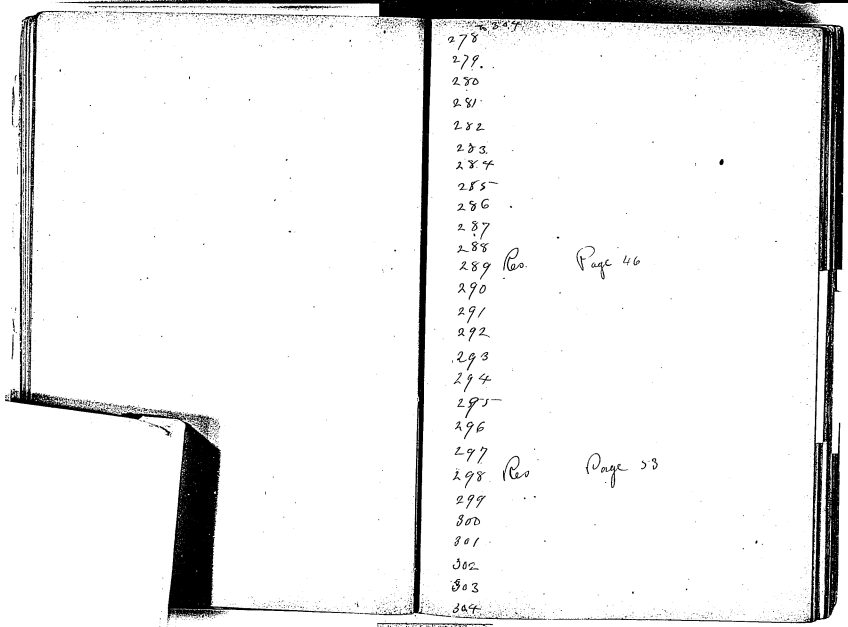
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289 Rec. Page 46
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298 Rec Page 53
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307 Reo 242. Page 95 Sealed
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313 Reo. 135 Page 37 Sealed 435
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322
323 Reo 114 Page 81 Sealed 1750 yrs
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328 Reo 135 Page 103
329 Reo Page 101
330
331 Reo 145 Page 41
332
333 Reo 137 Page 43
334 Reo. 145 Page 99

have printed before Smutty

335 Reo 115 Page 49
336 Reo 117 Page 47
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340 Reo 133 Page 57
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342 Reo 127 Page 45
343 Reo 147.5 Page 57
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349 Reo 142 Page 83
350 Reo 139 Page 85
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352 Reo 122 Page 75 Brooklyn
353 Reo 135 Page 79
354 Reo 134 Page 61
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360 Reo 125 Page 99 Bristol 3 / Oconomowoc
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365– Page 71 Reg 120 Bursted
366 Reg 130 Page 71
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371 Reg 124 Page 67 Bursted 470
372 Reg. 125– Page 65 Bursted 262
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375– Reg 145– Page 97
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378 Reg 112 Page 69
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394 Reg 105– Page 93 Bursted
395– Reg 141½ Bursted 18½ hrs Page 89

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398 Rec Page 44 Burdett 255
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417 Rec 131 Page 93
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4427 Reso 132 Page 111-

4428 Reso 132 Page 117

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4431 Reso 130. Page 107 Total hours 192. Rescinded

4432 Reso 132 Page 115 Total hours 115 Rescinded

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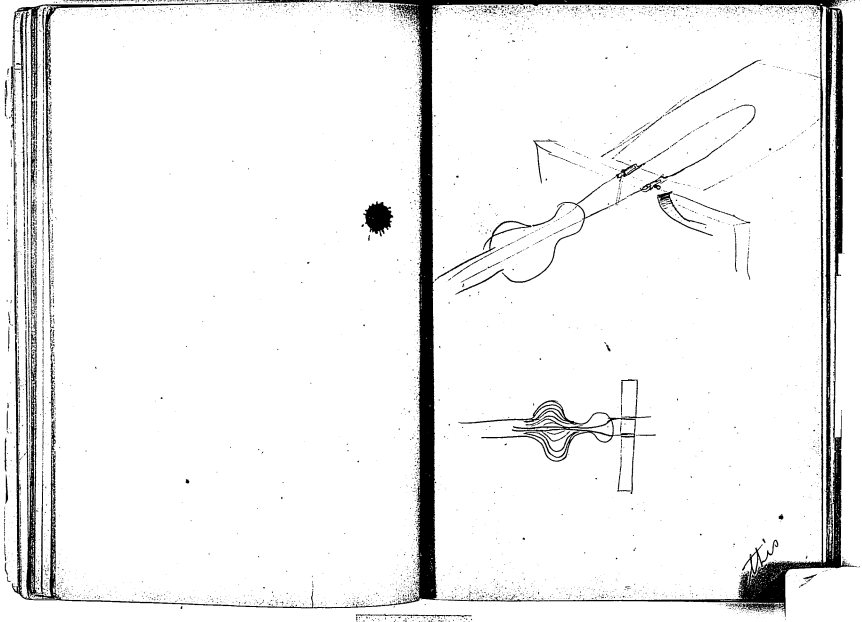

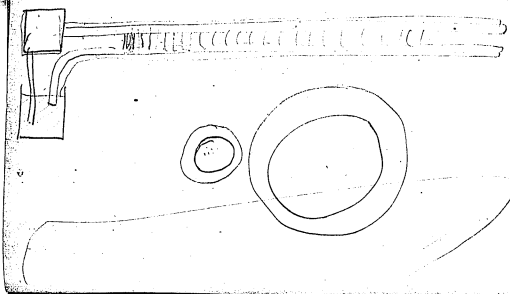

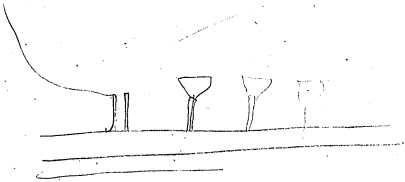

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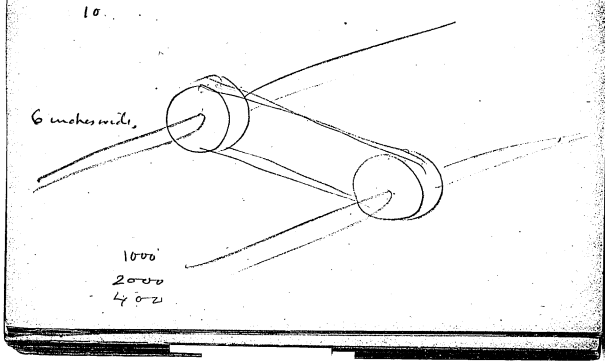
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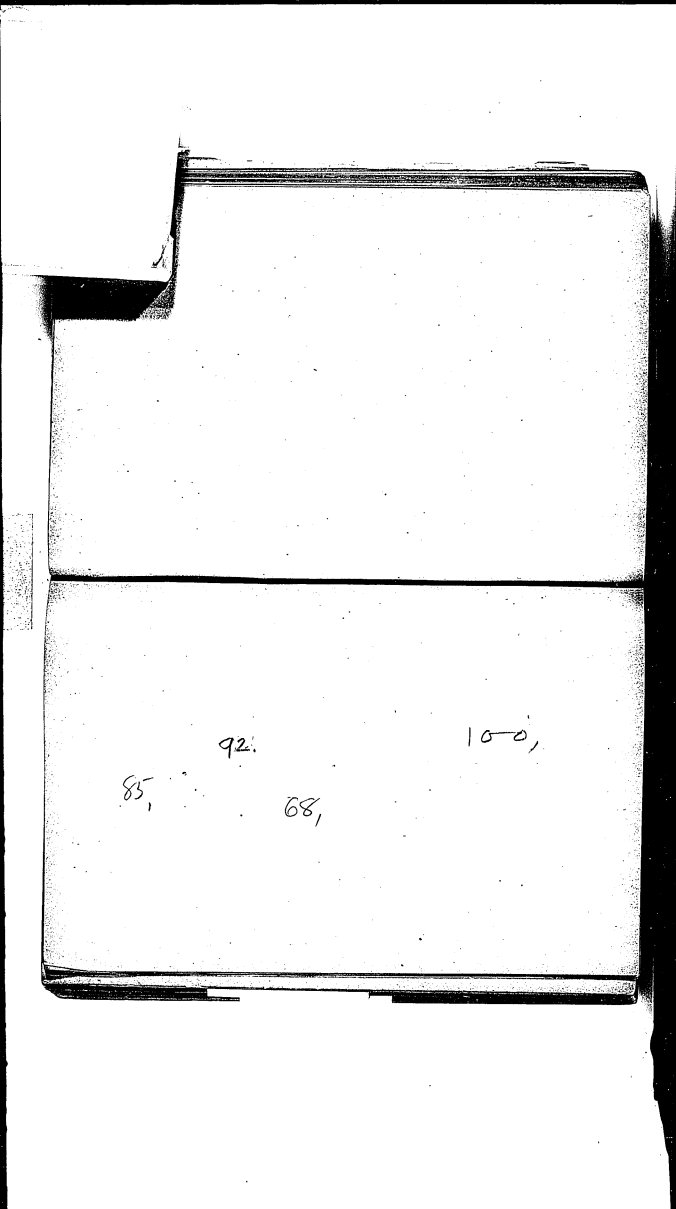
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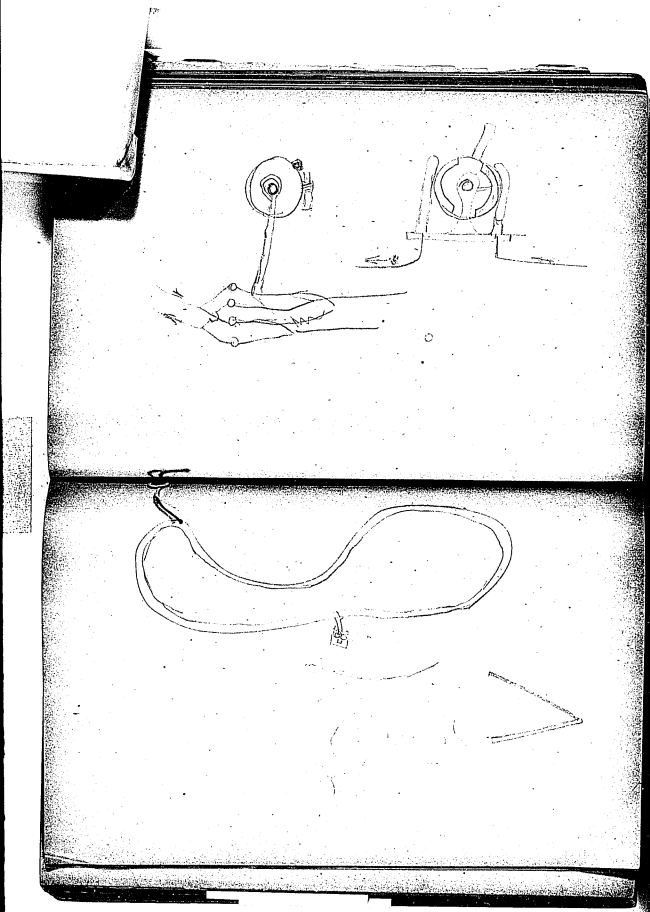

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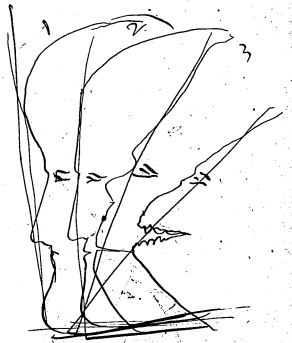

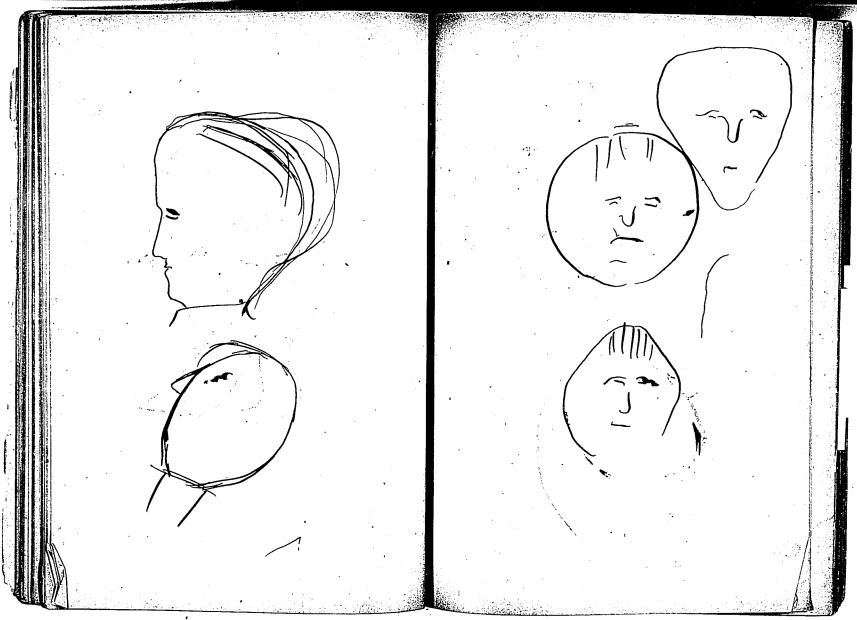

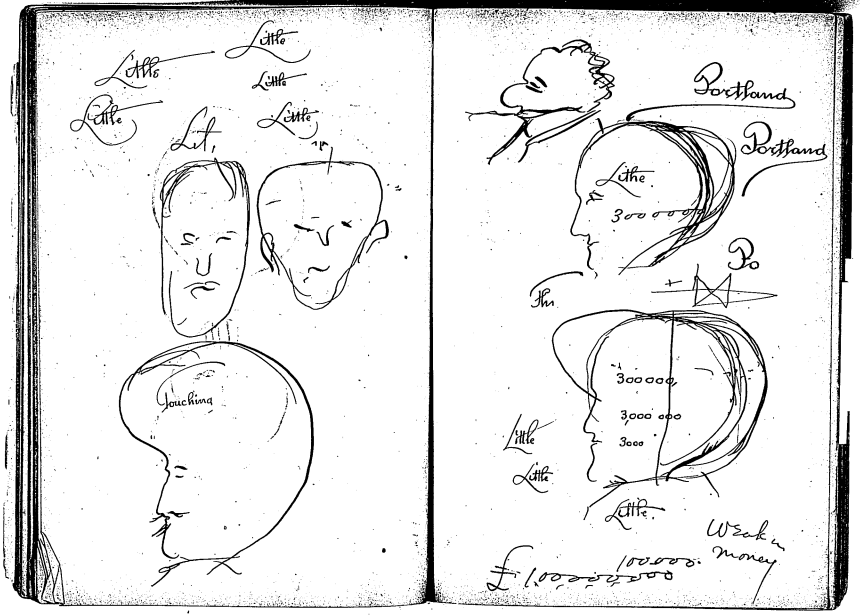
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To Edison House Feb 17 88

409 From the Office

172 " "

465 From Moffett's desk

349 Engine room

327 over Ceiling to Bell

570 Other Kinsley desks

1 Edisons parlors

one more from Office

Fm 2

.39
.11
.50

6.129
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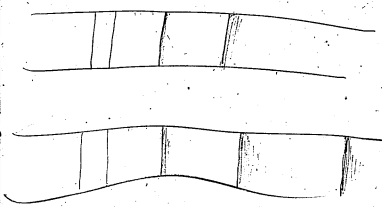
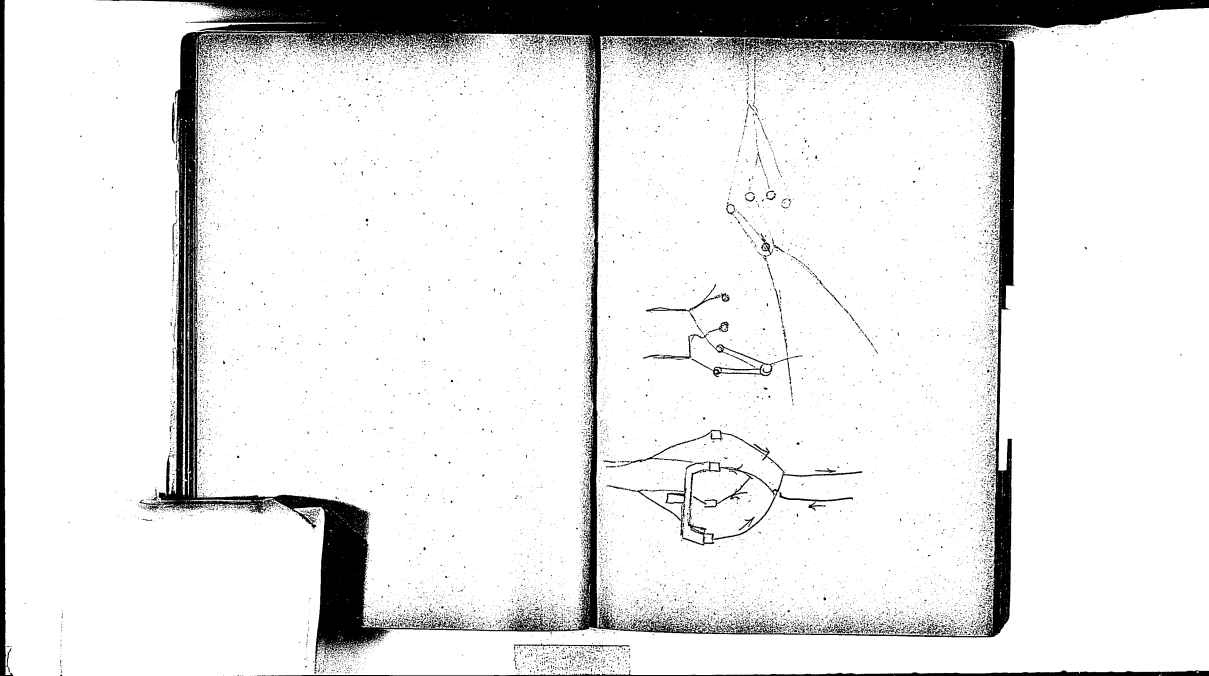
1.498970
.0784380
1.0784420

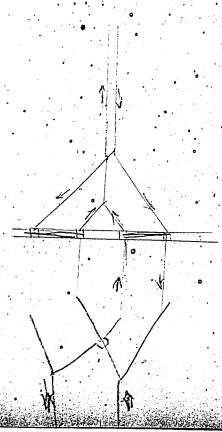
1st

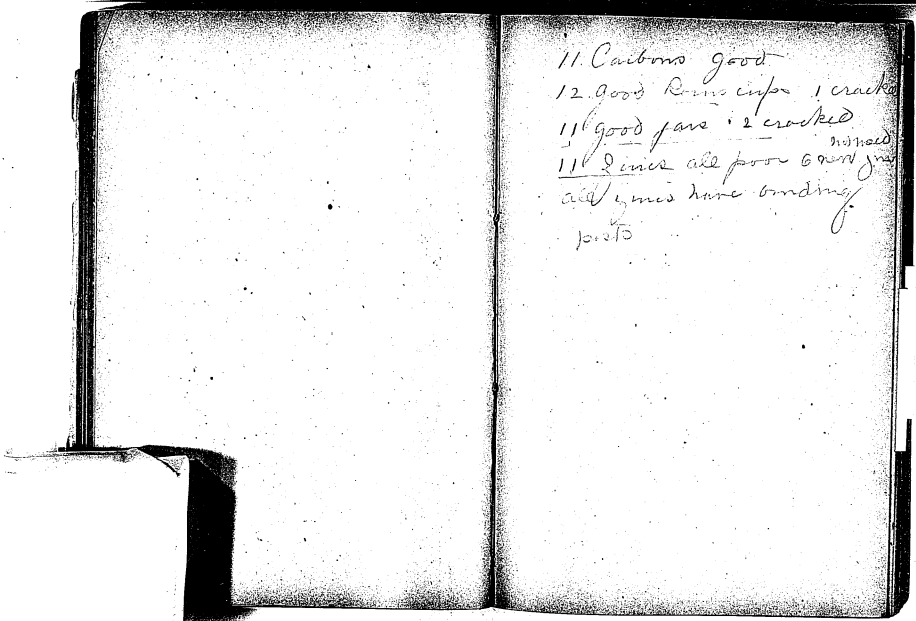


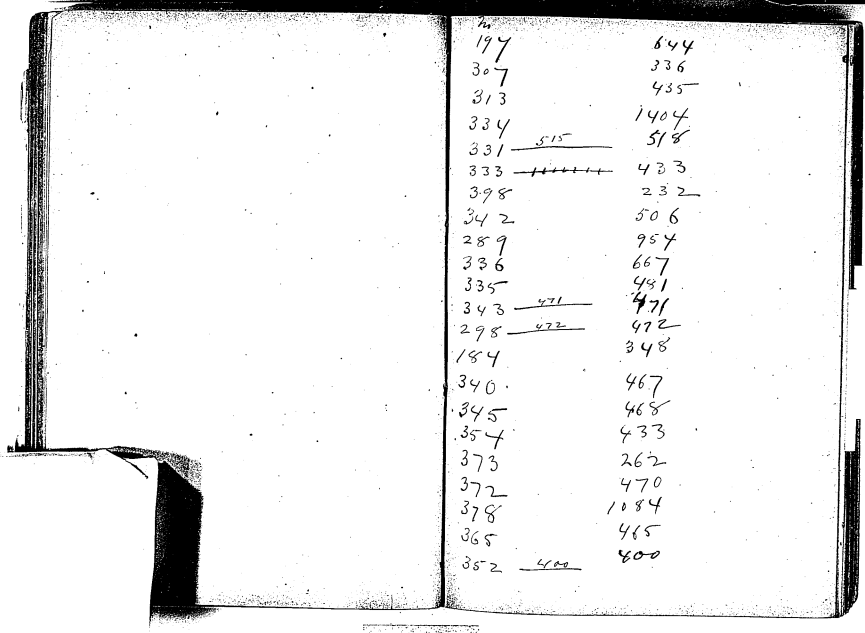
	Jars	Jams	Carboys
	2	2 poor	2
	/	/ "	/
	/	/ "	/
	#		
	/	/ "	/
	/	/ "	/
	/	/ "	/
	pomade	/ "	/
	Carboy		
	1 bad hole		/
	6	/ "	/
	[illegible]	/ "	/
	2 cracked jars		
	12		
	2 cracked jars	11 good poor	

	Poms cups
11 Carboys	2
12 Good poms cups	/
1 badly cracked	1 poor small cup lid
14 Jars good 2 cracked	
11 Jams all poor 2 good 2 not used	
poor binding pot	/
	/
	/
	/
	/
	/
	12
	12 small cracked
	1 badly cracked






11. Cartons good
12. good Receipts 1 cracked
11 good jars 2 cracked
11 pints all poor & worn jars
all pints have binding
posts



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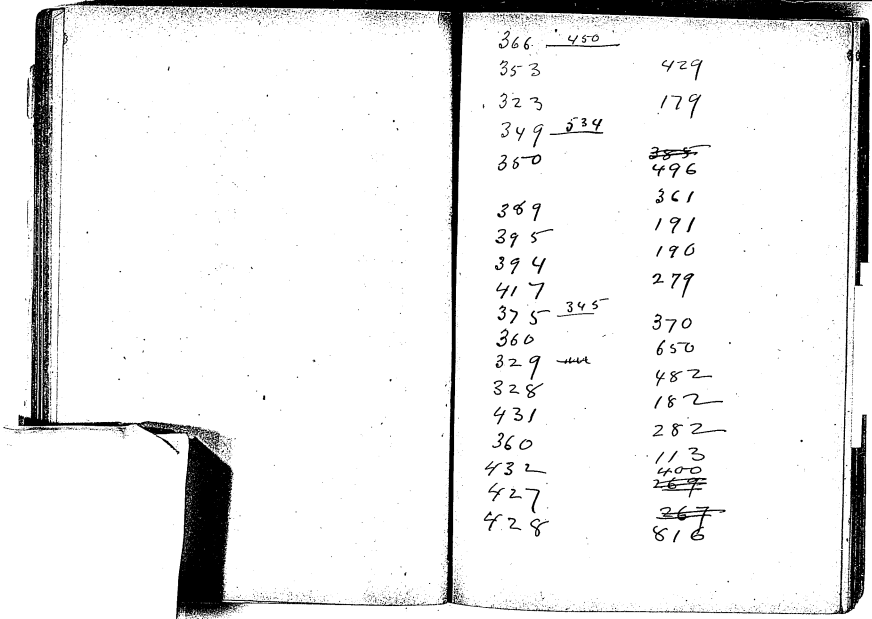

366 450
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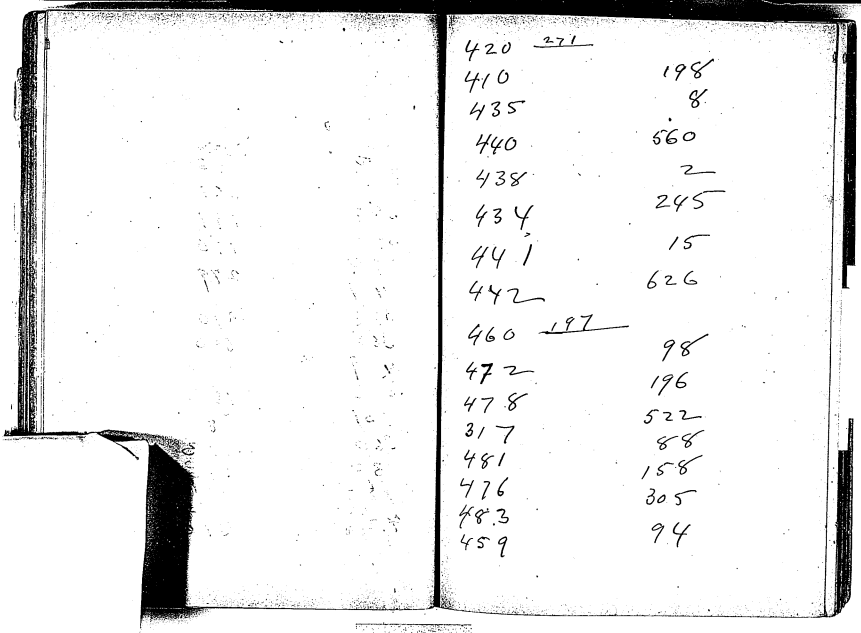
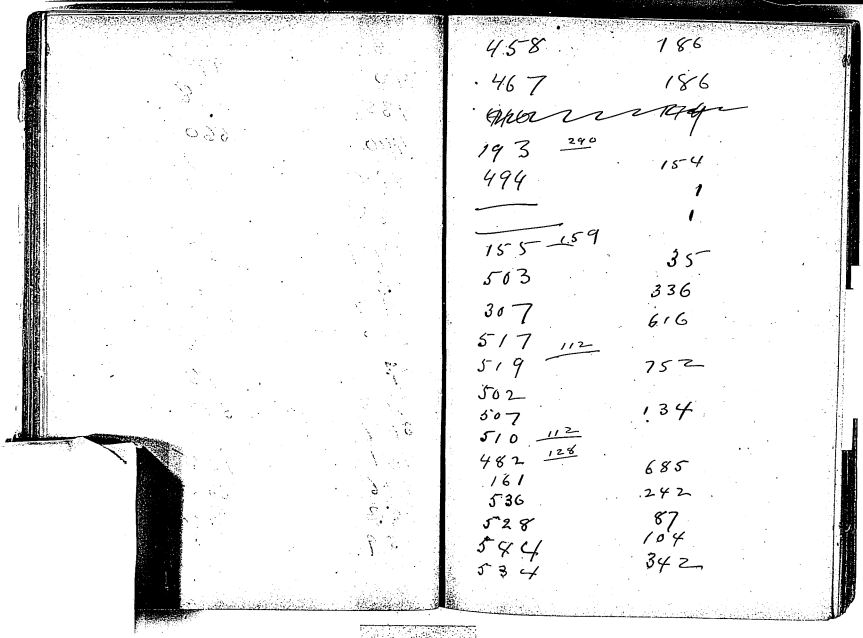
~~267~~
816

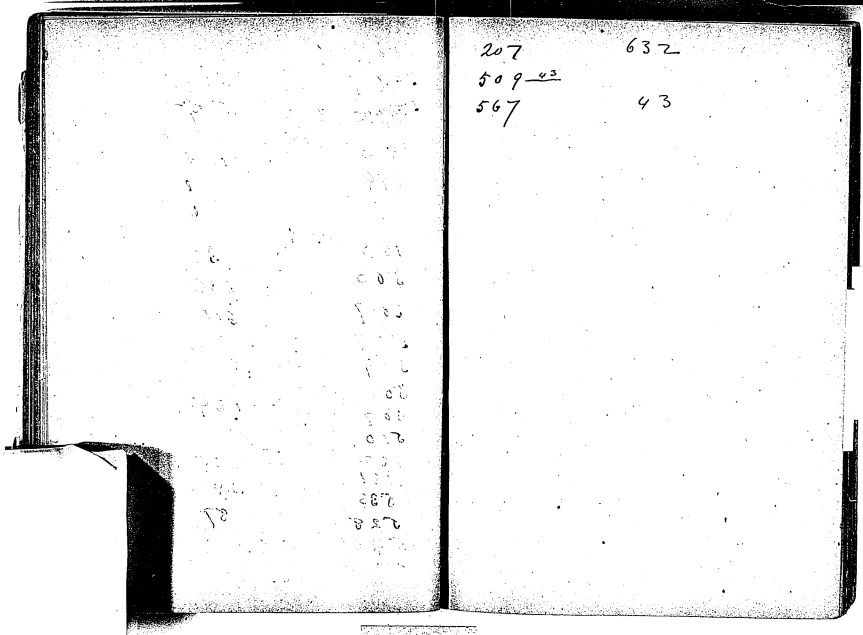


420	271	
410		198
435		8
440		560
438		2
434		245
441		15
442		626
460	197	
472		98
478		196
317		522
481		88
476		158
483		305
459		94

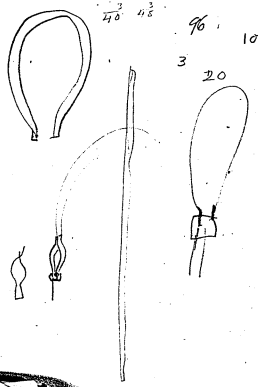


458
467
193 240
494
155 159
503
307
517
519 112
502
507
510 112
482 128
161
536
528
544
534

186
186
154
1
1
35
336
616
752
134
685
242
87
104
342


207
632
509-43
567
43

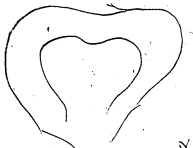
3000/ 45000 /



15 14 106
3/40 3/5 96 100
3 20

1

9ne



15.000.000
150.000.000

2.500
3000 fcc
7.500.000

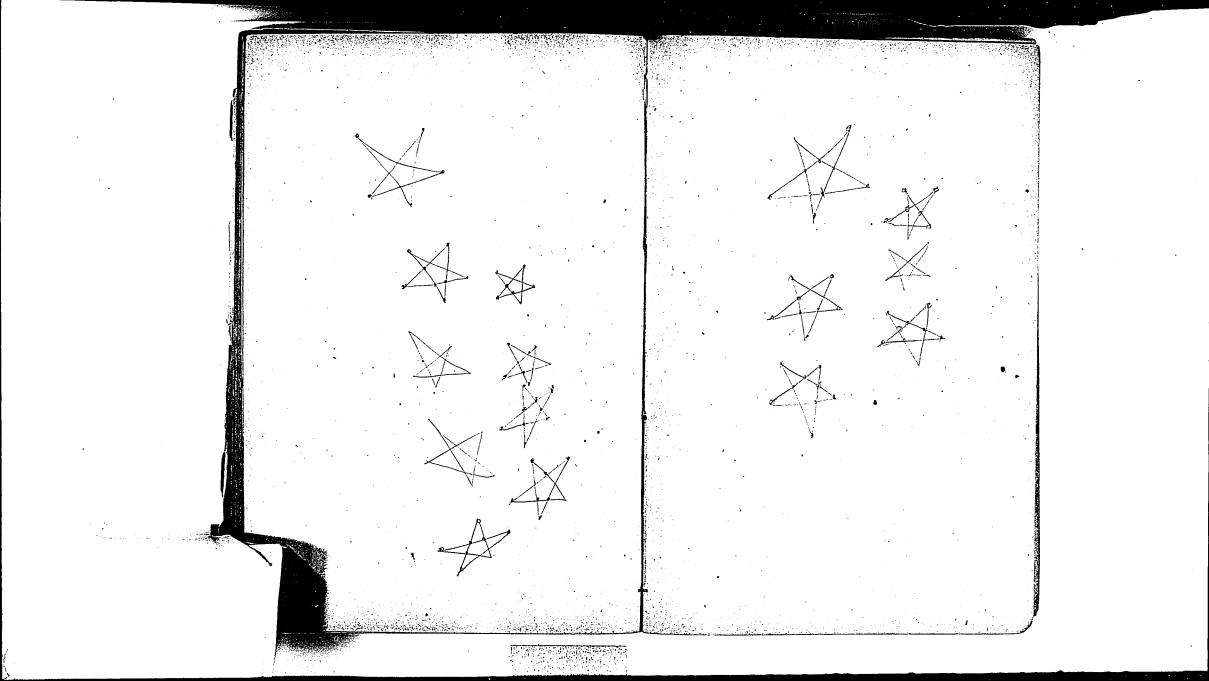
2500
3000

Pleno. m/— 10.000 Itm.

Pol-m obtid-4 co. final cal-
tima Inptim 4,30

Lab. 22 horas 12

Lab. 20 horas 84 ~~57~~ 8



12
34
56
78

176
94
81
131

Nums
94
94
94
94
134 Busted
94
94

176
81
131
176
94
94
94
81
81
131
94 2093

Nums
144
Busted
6 Busted
131
131
131
176
81 20
93 Busted
131
145 Busted
92 Busted
131
35
142 Busted
63.9
176
81
176
81
131
422
422
422 4030

22 / 141 = (8360
124 780
156

176
94
90
126 Busted
181
181
131
131
— Busted at 1st time made app.
94
68 Busted
81
176
81
81
131
131
131
131
145 Busted
176
112 Busted
131 2810

44
140 Busted
131
131
145
131
131
176
176
176
131
94
176
176

39 Busted

176
131
176
12
12
20

2564
+ Rec (141 Busted ago)

11397 hens with 14

Breakages

```
14 | 11397 | 814
     112
      19
      14
       57
```

```
   11397
    1506
14 | 9891 | 706
     98
      91
```

265	74	34	Brinkley
164	74		
172	74		34 — 92
158	74		79 — 112
270	143 Brinkley		"
242	71		
197	74		
834	112		

12 – 143 | 34 – 72 | 56 – 60

78

72		110
72		110
72		110
72		60
72		60
143	Bunted	60
72		110
180		110 Bunted
86		
72		
143		
60		
60		
110		
143		
72		
72		
72		
60		
60		
60		
110		
72		
143		
110		
110		
110		
143		
143		
143		

12

9

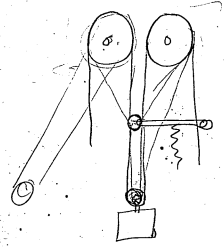
$6\frac{1}{2}$

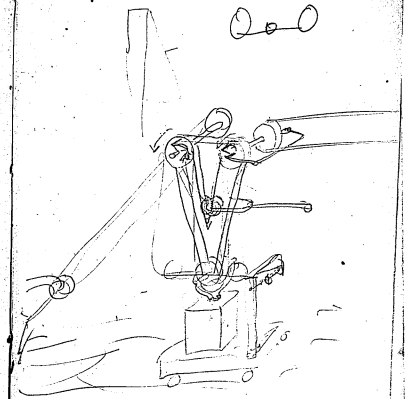
6.5
6.5
325
390
4225
4
16.900

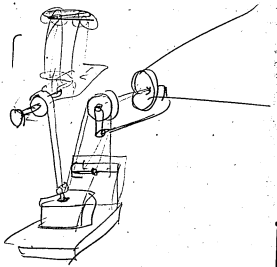
81 25
4225.

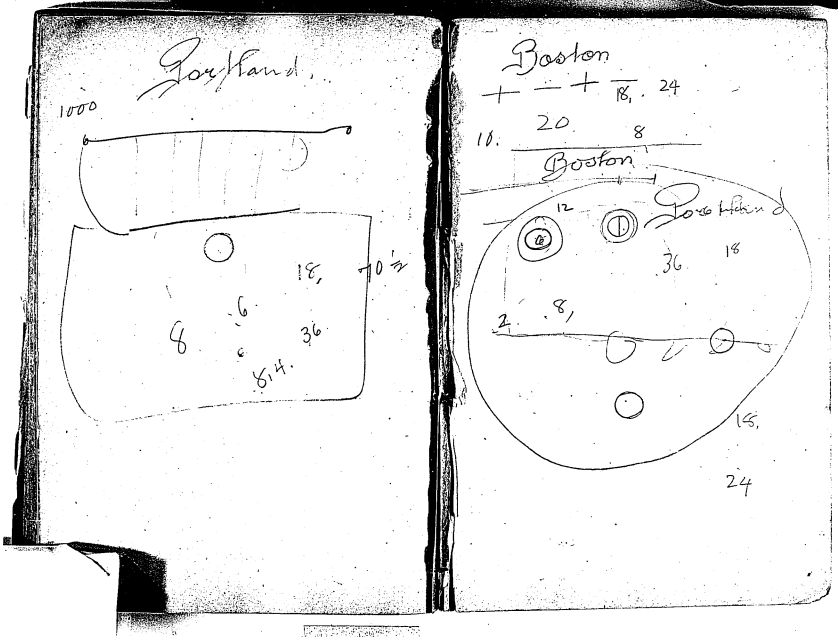
16.9) 81.0 (48
676
1340
1352

4,8 N. P








Boxford.
1000
18,
10'
6
36
8,4.
Boston
+ − + 18. 24
18. 20 8
Boston
12
Boxford
36
18
8,
15,
24

Menlo Park Notebook #79 [N-79-06-16.2]

This notebook covers the period June 1879-April 1880. Most of the entries are by Francis Upton. There are also a few entries by Edison and John Kruesi. The entries by Upton consist of notes, calculations, and drawings relating to generators and electric power distribution, including costs. The entries by Edison include a "law" about the strength of dynamo machines and notes and drawings of chalks for the telephone. The entries by Kruesi consist of notes, calculations and drawings relating to the construction of dynamo machines. The label on the front cover is marked "Regulator" and "transmission." The book contains 282 numbered pages.

Blank pages not filmed: 56-57, 234-281.

Missing page numbers: 157-158, 231-232.

Page 225 Brindle Machine 10
" 221 " " 6278510

No 19

LIBRARY OF THE

BOARD OF PATENT CONTROL,

120 BROADWAY, NEW YORK.

GENERAL ELECTRIC

[illegible] N.Y.C.

[illegible], 189[illegible].

June 16 1879

Standard 194 L
195

Bad connection or damper
208

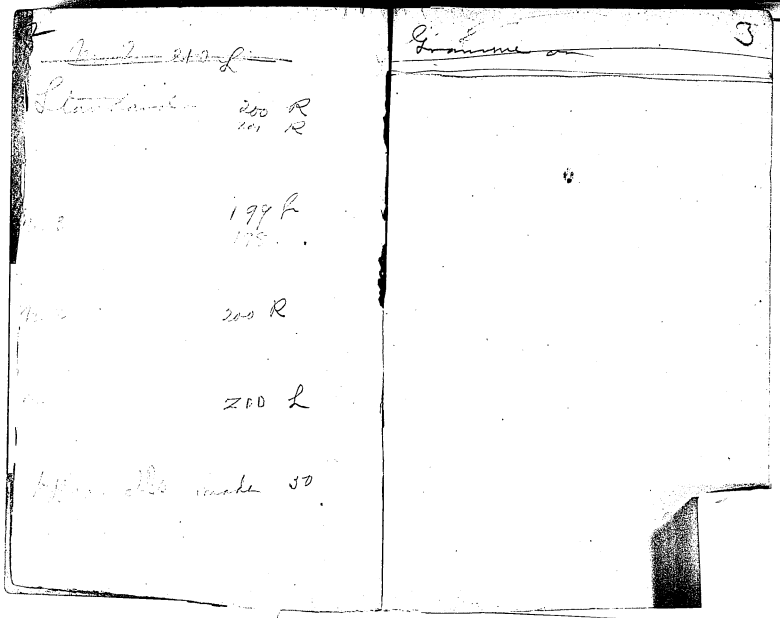
No 8 206 L
216 D

No. 8 186
176
206

No. 2

No. 1 211 R

Theabsence of [illegible]
[illegible]



4

Regulator 1

June 23 1879

4 inches of .003 2.0 ohms Pt. Iridium wire. heated to ~~white~~ brilliant yellow.

having 6.9 Ohms resistance cold. When the regulator puts on the wire fell to blackness

.003
3.14
3
.00942 surface 1 in
4
.03768

3 inches

6.9
1.72
5.18

2-10 P.M Commenced running on left-hand limit. 3 inches of .003 in Rt In 20% just red when still in the air. Changed feed under the hand Regulation very up was not on. Sparking

When starting red in air Yellow Red underhand at 2-35 It ceased to regulate the wire becoming dull red Now and then a few sparks. Stopped it. Not simply warm. Lower limit heated Upper limit hardly eaten away. Changed deviation of the current 2-40 P.M. so that the current should flow from the perfectly smooth lower limit

See page 13

a fly wheel would
probably have produced
this effect. At first
there would be more
powerful upheavals
in the current Then
it would gradually
have its speed become
more constant until the
sparks were made nearer
to each other

How to test ? ? ? ? ? ? ?

First put it into a shunt from the main current, so as to represent a number of lamps on the circuit. The shunt ~~representing one lamp~~ and the coils the deflector on a galvanometer.

12

Rec. Page 7 13

2-45 P.M.

2 or five minutes the regulator commenced to ~~work~~ work badly. Stopped a 2.50 though regulator quite fairly

at 2-55 put on again.

3.05 stopped regulating

Started again

2.50 Stopped

11.4 Amps in main

Inside 25 Amps Hot

Very warm

17

16
22.00
5.00 22
52
35.00

35 cars ore mined

7 cars coming in 1 day

5 lbs

450
16
2800
450
7300

.003
3
.01

.03 in mine
Camp 1/10 of Camp
16)50(.31 in camp
48
20

Regulator mining 8° = ∧
The weight on spring pulled
down 17° = ∧
Wire weight yellow.

The string raises a very small spark of an inch giving a spark. I can sight over the W.t. and hardly see it rise when the machine is regulating

Mr. Edison suggests a regulator which shall move up and down so as perhaps three sparks a minute shall be given. The lever vibrates between two points making connection and breaking it, when it breaks it must fall a distance before making contact, after

87 Ohm outside of regulator including wire

Put the machine timed without regulator through the wire. When I turn the main current on the wire melted with a snap

109
82
218
872
8938 Volts

6 Daniells 60

58 over 5.8 Ohms
Bright yellow
1.09 Weber 1.09

.60

over 76 Ohms
Total

Add for cooling
6 Ohms for cooling
82 Ohms Total

82 Volts in the circuit
around a shunt of 11.4 in
Ohmic circuit

2.2

13.4

16

16

5.45 Ohms running free
2 Ohms in machine

$\frac{2}{13.4} \quad \frac{2}{13.4} = \frac{10}{7.9}$ of Total

66 | 82 (122

160
162
180

109
8.478
942
10216 Volts

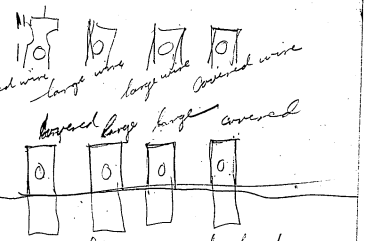
.003 20 ft

.003

20 Volt.
3

6.6	8235
	8235
9	1.9242
4	1.6964
	3.2476
	4.5185
18.6 per H.P.	1.2709

20



12.5 Ohms in each foot
12.5 Ohms in each foot
12.5 Ohms in each foot

3.1 $\frac{10}{3}$ 21.7 5.4

.030 surface

$\frac{1}{10}$ surface

5.4 Ohms cold
but 2½ times greater
2.7
10
13.5 Ohms

2 C. .003 20% .3 inches
13.5 Ohms to 1/10 the
Surface should be better
than an 100 Ohm Lamp
of 5/16 O

.004 20 %
4 inches

3.14
.004
.01256
4
4

.003 10% represents the sur-
face of a 180 Ohm Lamp

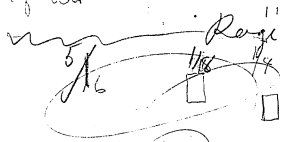
Why a wire does not
2d
represent a lamp especially
a short length.

In the first place there
is not enough energy to heat
the air that comes in contact
with it by radiation
~~communication~~

For example a wire Inched
three inches say .003 of an
inch in diameter has ~~nothing~~
1/10 of the surface of a 100
Ohm Lamp of 5/16 surface
~~thickness~~ but within a
half inch of the bottom is
140 inches
say on sa. of wire
all of which has an
effect in cooling the wire
by convection while

28

in the base wire there are say 2 1/2 circles of air



Bobbin

3/16 in diameter.

9/256 15/256 × 3.14 on ends

18

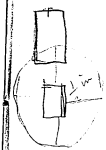
8 1/4
1/8
2512
3 1/4
5.652

5.7
25.6

29

say 1/4 in. high

9/256 × 1/4 = 9/



Thus with 1/10 the energy the straight wire has 1½ again as much air to heat to prevent convection currents.

Leaves (Eq) conduction. The straight wire while only giving off 1/10 of the energy has lost ½ 1/4 of the loss by conduction to the air. about 2½ times more proportionally.

803 209

55 over 7.5 Ohms. 31

Red bright

5 Daniells 50

55 over 7.5 Ohms

Yellow

60 L

Yellow bright

70 L

Very bright yellow

70 L

Very bright yellow

74

80 yellow white

50 yellow white

Over 7.5

Watch in watch 50

Lee

7.2 Webers

.84 7, 9243

.84 7, 9243

100 = 1

4.3 1. 5464

5. 4950

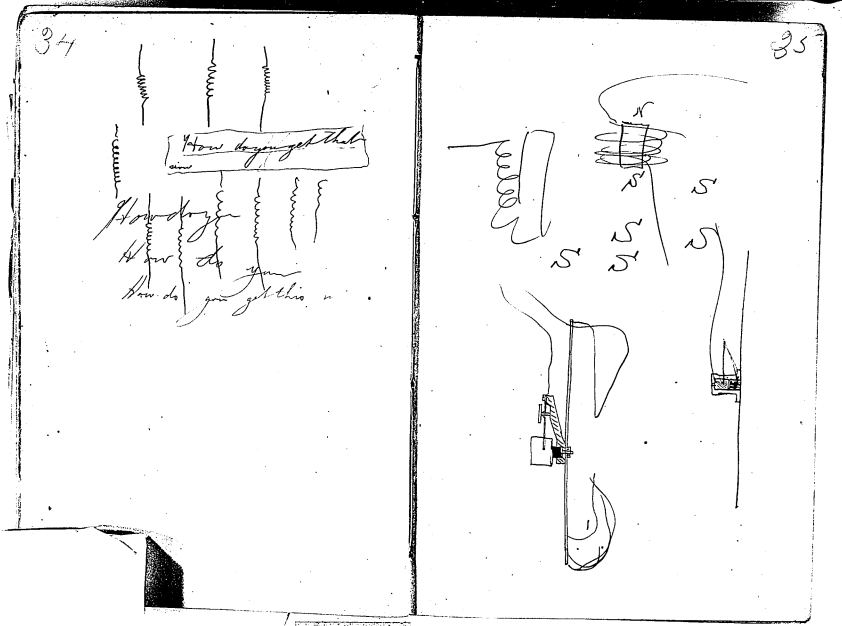
4. 5185

1. 0 = 35

13 per 4.6

1 weber

7.4 per K. P


34
How do you get this
35

35 Small regulator

[illegible] nearly
[illegible] Long [illegible] temperature

[illegible] 1 cell 18° : D
[illegible] 1
Could [illegible] work difference
in [illegible]

2 cells could [illegible]
the other way [illegible] though
could [illegible]
Strikes [illegible] 32° : D
running [illegible] 25° = D
quite fast.

Bells 37
Slightly faster than
the [illegible] after [illegible]
2 cells 25° = D
4 [illegible]
37° : D
5 cells
6 cells
7 cells
39° : D
Running fast
[illegible] 36°
5 cells 33° 30
5 cells 30 [illegible]
[illegible] 4 cells 27°
[illegible] 21°

38

5 cells

way up 12°

way low 40°

2 cells way up not working

way low 5°

39

100 Ohms of Ag H_2O

How many Webers

$100 \times \frac{3}{5} = \frac{300}{5}$

$= 66.10$

1.8175
1.6464
.1731
.0980

1492

1.02 Webers

100 Volts

5 cells through 6 Ohms

gave 15° on galva

$\frac{10}{6} = \frac{5}{3}$ Webers

9° = Deflection for 1 Weber

For a 30 Ohm Coil the regulator should measure between 5 Amps the galvanometer between 9° and 12°

42

Regulator ...
... current ...
... (or ½ of time)
... current is regulated
... energy ... the num-
... and ... things
... regulator is with
... energy
... ate-
... and ... ng
... galvanometer
... first put the current
... through a rheostat
... until the deflection

... is 10 or 12 degrees &
... and note the color
... The try the regulator
... to adjust ... that
... the regulator and lamp
... its own current with
... by ... the energy
... the ... but to ...
... the shape of the ...
... ...
... ...
...

This current became more
[illegible]

The best test of a
regulator would be
[illegible]
to put it on an Electric
Dynamometer and see
how near to a constant
[illegible]
could be obtained
[illegible]
of current [illegible]

Put a rheostat in circuit
and obtained results showing
that the resistance introduced
into the circuit and
the [illegible] produced, the fall
of pressure at
[illegible]

15 How do you do

No weights

7° 30' 6 cells Hanged out
joint moves
the regulator but
does not start it

8° 30' 7 cells
Starts part of the time
does not move at
position three one
zero count

9° starts

9° 15 " " red

9° 45 " " red

yellow

10° starts, runs freely
yellow red

regulates to 8° 30'
6'

left running for 15 minutes
when regulator stopped
Jar started it

running free 9' 30'

78

Full battery on

6° 3 spiral red

7° 1 yellow

8° 2 bright yellow

14 cells

6° regulator the same

spiral red

10 cells

8° spiral very dull red

This will spoil the water

12° regulator stopped 119

very bright yellow

spiral started

Another spiral warmed

much ~~Broken~~ hotter

00 & Rt wind

spiral

~~bags~~ yellow start to

the bottom turn

13°

Steam strong

necessary to ensure

contact

Regulator very up 9°

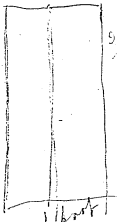
red spiral

5°

Regulator just running
5°

Attached to Cuvette
5° 30'
running much faster

Two resistance coils.



4 cells on magnet
1 division 4° 45' 57
third flash

2 divisions 8°
faintest red

3 divisions 8° 20'

4 divisions 5° 45'
light red

5 divisions 9°
light red two turns
dark at bottom

6 9° 15'
light red

7 9' 30"

8 9' 45"

52

9 divisions

10° —

10 10°

11 10° 1≤1

12 10 ¼ 0'

~~25~~ 10° 30'
~~10~~

~~24~~ 11° 15

23 slipped

53

15 divisions 4 cells 10° 30
light red

15 5 cells 10°

15 divisions 6 cells
a little bright 9° 45

Worn string for section

3 divisions

7 cells 3-45 11 M

~~Left~~ very little difference in
color between 4 cells

10° 30 yellow slightly red

at 4-15 both points
~~sepa~~ making shades

10° 30'

54

1.7 Gramme
from 8 Troy oz

117
3000
51000

5100 Gramme

34)5100(
34
7

31)5100(161
31
200
186
40

53

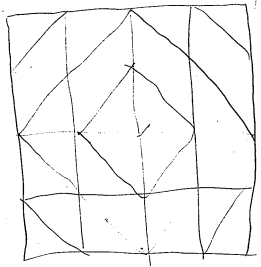
28.3)5100.0(180
283
2270
2264

180
15
900
180
2700

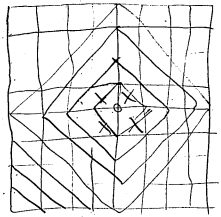
58

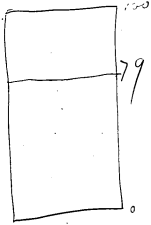
59

60 If $3. $3. for capitol
Aug 7 $3. for capitol
$30 for capitol
capitol capitol capitol capitol capitol capitol
road
round



61





62

1	1750
2	1500
3	1250
4	1000
3	750
2	500
1	250
16	

3500

3000

2500

2000

1500

1000

500

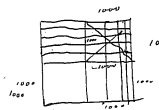
31.25
112500

95.50
70.32
70.32
48.82
48.82
48.82
125.
17.57
17.57
17.57
7.81
7.81
1.95
577.88

63

11) 577 (36
48
97

64



2

1	3800 1900	3800
2	3600 ✓	3600
3	3400 ✓	3400
4	3200 ✓	3200
5	3000 ✓	3000
6	2800 ✓	2800
7	2600 ✓	2600
8	2400 ✓	
9	2200 ✓	
10	2000 ✓	
9	1800 ✓	
8	1600 ✓	
7	1400 ✓	
6	1200 ✓	
5	1000 ✓	
4	800 ✓	
3	600 ✓	
2	400 ✓	
1	200	
0	0	

16

¥
100
100
100
100
1900

10125
2
202 50
90.25
3
270 75
70.32
5
351 60
61.25
6
367 50
52.77
7
369 39
45.00
8
366.00
37.80
9
34170

25.31
9
227.79

15.31
7
107 17

11.25
6
67 50

7.87
5
39.35
3

112.75
202.50 36 00
270 75
320.00
351.60
367.50
369.39 369 39
360.00 369 39
340.20
312.50
227.79
160.00
107.17
67.50
39.35
20.00
8.43
2.50
.31

3640.30

160 feet = kgl
set

$36.40 for each

$364 for Camp

2000 X .4 = 16 00

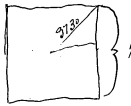
3200

65

69

2)5280

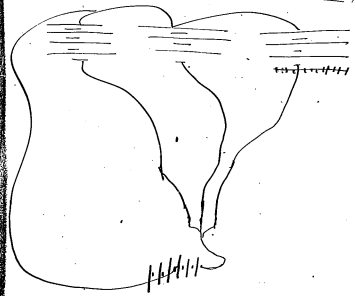
2640 2640

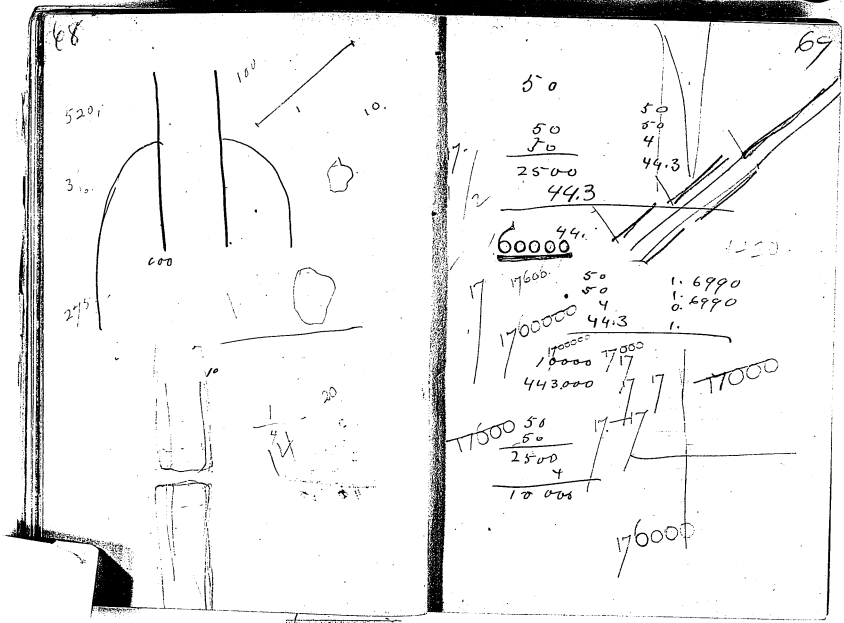


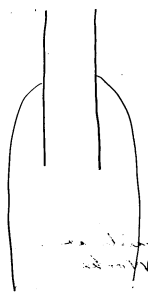
2640 3.4216
2640 3.4216
6.8432

6970000
6970000
13940000 | 7.1492
3.5721

3730




68
69
5280
3.
600
100
1
10.
10
20
1/4
50
50
4
44.3
25-00
44.3
60000
44.
17600.
1.6990
0.6990
1.
1700000
10000
443000
17000
17
17000
50
50
25-00
4
10 000
17600



1.25 Total

100 Volts in put 1 Ohm

50 V —— — 2nd 1/4 Ohm

50

$\frac{2500}{1.25} \times 44.3$

2500	3.3979
44.3	1.6464
1.25	9.9031
	4.9474

88600 resistance

88600 Work

100
75

$\frac{25^2}{1.25}$ X 44.3

1.3979
1.3979
9.9031
1.6464
4.3453

23,100 resistance
3
69,300 Work

90

$\frac{100}{1.25}$ X 44.3

2
9.9031
1.6464
3.5495

3540 resistance
9
31,860 work

$\frac{100}{2}$

50

44.3
50
2215.0 Resistance
9
19935 Work

33.3 1.5224
44,3 1.6464
3,1688

146

10 Ohms

100

~~4430~~

10 Ohm
1 ohm

$\frac{100}{11}$ 44.3

2
8.9586
1.6464
2.6050

402
9
3618. Work

Law

The strength of a Dynamo machine
is as the square of its size. If you
double the size of your machine
it is four times as powerful.

100 Volts
90 Amps

.9 of the total work done in the machine

100 | 44.3

1 Ohms
4480
9
39870

2 Ohms
2000 | 2 | 7
44.3 | 11444
2 | 9.6998
33454

2215 | 9 69542
42996
19950

3 ohms: 3 | 44430
1477
9
13293

4 Ohms 4 | 4430
1107
9
9963

5 Ohms 5 | 4430
886
9
7974

6 Ohms
738
6646

7 Ohms 7 | 4430
633
9
5697

8 Ohms
553
4981

9 Ohms
492
4431

10 Ohms
443
3987

11 Ohms 11 | 4420
427
9
3843

14 Ohms
316
2848

16 Ohms
276
2492

18 Ohms
246
2215

20 Ohms
221
1993

78

12 | 1000.80 | 24
367 | 164
9
3391 | 1660

80 Volts on running
120 Volts on starting
220 Volts on line

79

1 Ohm under
1 Ohm [illegible]

400 / 2 = 200 / 44.3

200
8860.0
4
35440

1 Ohm under
2 Ohm

44.3
3 | 177.200
5906.6
2
236264

80

Gallons Total 17720

4430

17720

5 | 17720 — 25

35440 — 708

4

14176 — 2835

6 | 17720 — 30

2953 — 590

4

11732 — 2346

7 | 17720 — 14 — 1265

2531 — 5063

4

10124

8 | 17720

2215 — 11107

4

8860 — 4443

81

16

4

9/4

120

120

14400 — 4.1584

2.5 — 9.6021

44.3 — 1.6464

5.4069

4.185

250,000 — .8884

4i

16

6

12 | 96 — 8

17

82

9 | 17720 — 18

1969 — 4 — 7876 — 984 — 3938

1772 — 4 — 7088 — 20 886 — 3544

11 | 17720 — 1611 — 4 — 6444 — 22 — 805 — 3222

12 | 17720 — 1477 — 84 — 57 08 — 24 — 738 — 2954

83

30 — 30 — 900 — 44.3 — 398 700. 0.0

39870

2 | 39870 — 3 | 19935 — 6645 — 7 — 93030 10 ohm Total

2 | 46515 — 2 Ohms Total

2 | 23257 — 4 Ohms Total

2 | 11628 — 8 Ohms Total

2 | 5814 — 16 Ohm —

2 | 2907 — 32 Ohm —

1453 — 64 Ohms

3 | 46515

3 | 15505 — 6 Ohm —

2 | 7752 — 12 Ohm —

2 | 3876 — 24 Ohm —

1936 — 48 Ohms Total

3 | 15505

5168 — 18 Ohms

84

3 | 93030
3 | 31010 — 2 Ohms
10336 — 9 Ohms
18606 — 5 Ohms
9303 — 10 Ohms

60 Volts Opposed 8J
two
40 Volts active

1,600

44.3 / 1600 / 265800 / 443 / 2 | 170880 / 35440

44.3
1600
265800
443
2 | 170880
35440

2 | 170880
2 | 35440 — 2 Ohms
2 | 17720 — 4 Ohms
2 | 8860 — 8 Ohms
2 | 4430 — 16 Ohms
2215 — 32 Ohms

3 | 106320
3 | 35440 — 3 Ohms
3 | 11813 — 9 Ohms
3 | 3671 — 27 Ohms
1224 — 81 Ohms

3544 30 Ohms
5316 20 Ohms

44.3 / 1600 / 265800 / 443 / 2 | 265800 / 132900 / 3 | 398700

6
2.5 Ω
1.65

35448
3
2 | 106320
2 | 53160 — 2 Ohms
2 | 26580 — 4 Ohms
2 | 13290 — 8 Ohms
2 | 6645 — 16 Ohms
3 | 3322 — 32 Ohms
166.1 — 64 Ohms

3 | 53160
3 | 17720 — 6 Ohms
3 | 5907 — 18 Ohms
1969 — 54

2 | 17720
2 | 8860 — 12 Ohms
2 | 4430 — 24 Ohms
2215 — 48 Ohms

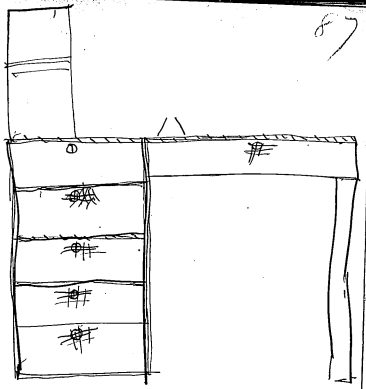
443
2500
221500
886
2 | 110750 1 Ohm
2 | 55375 2 ohms
2 | 27687 4
2 | 13843 8
2 | 6921 16
2 | 3460 32
1730 64

50 Volts

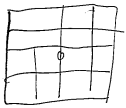
3 | 110750
3 | 36916 3 Ohm
3 | 12305 9 Ohm
3 | 4101 27 Ohms
1367 81 Ohms

2 | 36916
2 | 18458 6 Ohms
2 | 9229 12 Ohm
2 | 4614 24 Ohms
2307 48 ohms

22150 5 Ohms
11075 10 Ohms
5537 20 Ohms
3692 30 Ohms
2768 40 ohms



88



89

$7x - 3y = 1$

$11_3 - 7u = 1$

$4_3 - 7y = 1$

$19x - 3u = 1$

$y = \frac{7x-1}{3}$

$u = \frac{19x-1}{3}$

$11_3 - \frac{\cancel{48}\ 133\ 7x+19x-7}{3} = 1$

$\begin{array}{r} 19 \\ 7 \\ \hline 133 \end{array}$

$4_3 - \frac{49x-7}{3} = 1$

$7_3 - \frac{84x}{3} = 1$

$21_3 - 84x = 3$

$3 = \frac{84x+3}{21} = 4x + \frac{1}{7}$

$16x + \frac{4}{7} - \frac{49x-7}{3} = 1$

$48x + \frac{12}{7} - 49x + \frac{49}{7} = 3$

$-x = -\frac{67}{7} + \frac{21}{7} = -\frac{46}{7}$

$x = \frac{46}{7}$

90

$7x - 3y = 1$

$11x - 7u = 1$

$43 - 7y = 1$

$19x - 3u = 1$

$49x - 21y = 7$

$123 - 21y = 3$

$49x - 123 = 4$

~~$49x - 123 = 4$~~

$333 - 21u = 3$

$1331 - 21u = 7$

$133x - 33z = 4$

$49x - 123 = 4$

$84x - 21z = 0$

~~$7x - \frac{12}{33} z = 4$~~

$12x - 3z = 0$

$12x - 3z = 9$.

$48x - 12z = 0$

$x = 4$ $y = 9$

$z = 16$ $u = 25$

16
16
175
25

12
12
132
1
133
7

16
4
64
63

---

b65

91

2165 1/2 mile area

4000 : 2165 :: 5280 : x

5280	3.7226	
2165	3.3355	
4000	6.3979	
	3.4560	

2650

$63.50

---

1 mile area

63.50
4

$253.00

92

1 Ohm machines
10 machines
10 Receivers
15 Ohms in conductors

100 Volts
75 Volts

Ohms 15 for conductors
" $\frac{20}{35}$ " machines

250 Volts

250	2.3979
250	2.3979
44.3	1.6464
comp 35	8.4559 −10
	4.8981
	.4771
79,100	5.3752
3	4.5185
237.300	
7.18	1.8567

~~5.77~~ H.P.

1000 Volts on line

93

½ Ohm machines
15 Ohms in conductors
10 " " machines

25 Ohms total

~~5.78~~ × $\frac{3}{5}$ = 3.468

17.18
1.43
10.01

~~7.93~~ H. P. given off by machines
10.01

1.~~0~~ H. P. per machine

150 Volts from 1/4 Ohm machine
100 Volts receiver

50 Volts astrue
10 machines
500 Volts astrue 20 ohms total

500 250000
000
20 | 4,4,3
2.215

4 | 2.2215.0000
553,000 ft Cu
1,106,000
51 7427
4. 5185
1.2242

16.7 H.P. in receiver
2
33.4 H.P. in work

3.34 H.P. per machines
1500 Volts on line

3860 feet .2 in diam
Cost $114.

20 miles

	#	25 / 16
	114	2.0569
	25	1.3979
comp	16	8.7959
		2.1256 07
	178	2.2504
	5280	3.7226
	20	1.30103
comp	3860	6.4134
		3.6874

$ 4.860

1.4370
8.6021
1.2041

17.5 Ohms 1.2432

Conductor $5.000
20 Machines 2000
Turbines &c 2.000
$9,000

33.4 H.P.

9.000 3.9542
33.4 1.5237
2.4305

$270 per H.P.

$27 a year

365 1.4305
2.5623
2.8672

$0.0735 ~~cts~~ per day for 14.P.
7.35 cts.

24 .8672
1.3802
1.4870

.3 cts
3 mills per hour

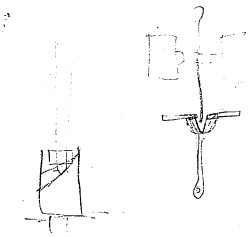
1/3 of a cent per hour for H.P. for the interest on plant

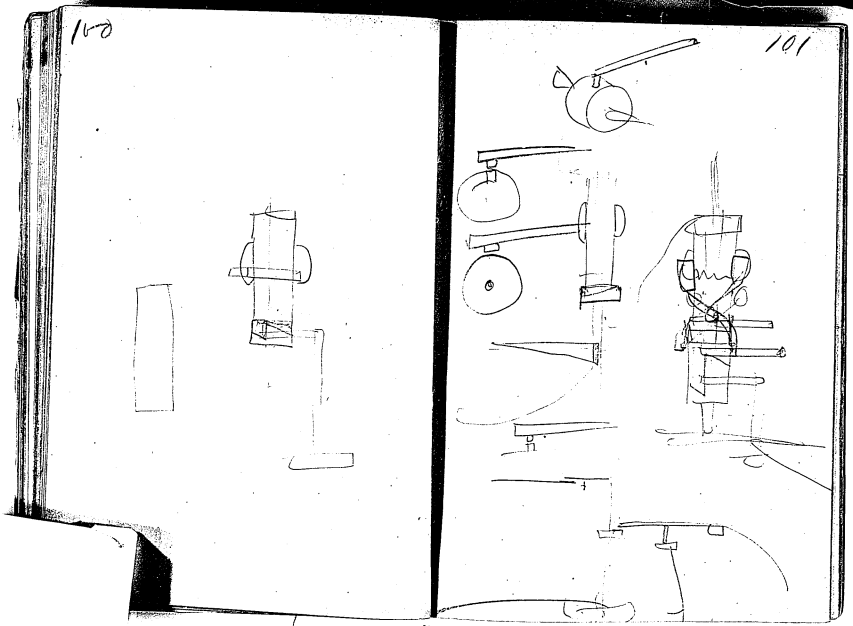
750	2.8751
750	2.8751
Comp 20	8.6990
44.3	1.6464
	6.0956

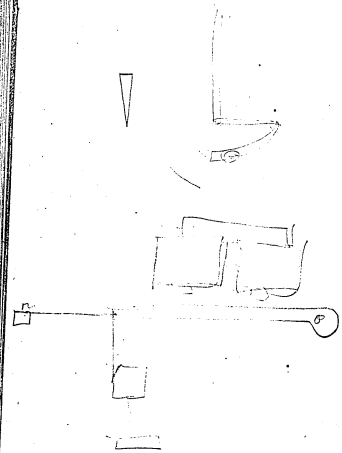
1,240,000

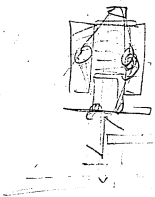
~~250~~000. 5.3979
18. 1.2553
4.1426

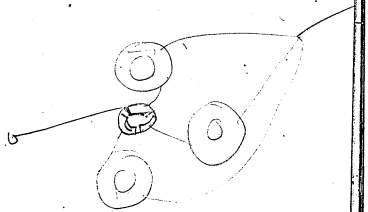
~~138~~00

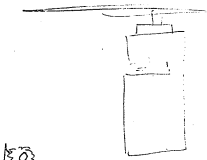


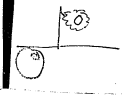

100
101











3 miles distance

150 Volts sending instrument
100 Volts receiver

92% to machines

	1 Ohm Total Volts
1 Machine	2 Ohms
5 Machines	3 Ohms
10 Machines	4 Ohms
15 Machines	5 Ohms
20 Machines	10 Ohms
25 Machines	15 Ohms
30 Machines	20 Ohms
40 Machines	25 Ohms
50 Machines	30 Ohms
	35 Ohms
	40 Ohms
	50 Ohms
	60 Ohms

92
92
184

200
180

828
8467 %

1000 feet .101 Diameter

1 Ohm

$\frac{1}{.101} \times \frac{1}{101}$

101
101
101
101
10201

$\frac{1}{102}$

7.9914

2.09805

1000 feet .101

100201
1000

.101 Diam

.001

101
101
101
1.01
10201
10000 = 10.2 Ohms

60
32
28

9/5
5/9

15

10.2

.0038
15
190
38
.0570

1/1.02
1.05

= 9.71'

.0086
.0212
.9874

1 Mile of Cu

5280
2640

1/2 mile 2640 feet

.164 in. in diam

1 mile
.328 in. in diam.

1/2 mile
.0205
4
1 mile .0410

100.00
1.0410
41.0000

217.8 lbs
4
871.2 lbs

$54.45
4
$217.80

Cost

600 ft. Philadelphia Standard Scale

	1 Ohm Weight	1 Ohm Coat 250 lbs	2 Ohms	3 Ohms
1 mile				
2 miles				
3 miles				
4 miles				
5 miles				
10 miles				
15 "				
20 "				
25 "				
30 "				
35 "				
40 "				
50 "				
60 "				

14
14
56
17
196

~~1393~~

4 | 871.20.
21780

871.2
36
52272
26136
31363.2

871
49
7839
3484
4 | 42679 00
10669 75

7841
9
70569

(196025 00
490 0625

4 | 784100
196025

4 | 2178000
544500

1000
1000

24 / 1000000
50,000

1000

44.3
5.0004
2,21 5,0004

33) 2,215.000 (66 H. P.
198
235

33) 2215 (20

66 H. P.
66
132 H. P.
264 H. P.

20

5. ~~4220~~

40,000

16
4
264 H. P.

1000 Volts effective

1500
2000
2500
3000
4000
5000
6000
7000
8000
9000
10000
15000
20000
25000

2 | 1000000
500000

1000 1000 1000
1500 1500 1500
2000 2000 2000
2500 2500 2500
3000 3000 3000
4000 4000 4000
5000 5000 5

6000
7000
8000
9000

1.1277
7.5 8751
7.5 8751
2.8779

2276
7555

100 Volts
100
10000
44.38

33 | 443000 ft. lbs.
1342 H.P.
33
113
99
140
132
80

1.5
1.5
7.5
1.5
22.5

1277
3522
4799
3019

13.42 1.1277 1.5
1.5 0.1761 1.5
1.5 0.1761
1.4799

3019

12078
9
108702

13.42 1.1277
2.5 .3779
2.5 .3779
1.9235

83854
33540

1342
9
120778

87804
35120

1342 | 33550

3000 Volts each wire.
9000 Total
90 machines

90) 377 . (4. HP. per machine
90 machines
35 Ohms

90 machines
45 Ohms

1886 / 2 = 3.76
3.77 / 2
3.76

$/100

Cost of water power

10.0 / 365

cost of water power
.437

.0274 cost of dynamo.
24) .0274 (.001

60 machines 150 Volts each

(300 Ohms 30 30 30 30 30 30 30 30 30 30

6000 H.P.

6000 Irons 3.03

6000 receivers 1.88 / 2 = 3.76

4 Ohms 5445 10 miles

23.445

376 H.P.
75
300

300) 23445 (78.15

$78.15 per H.P.

$75

$1 interest per day

$\frac{1}{365} = .000274$

100 ... 10 cts

$100

$.0274

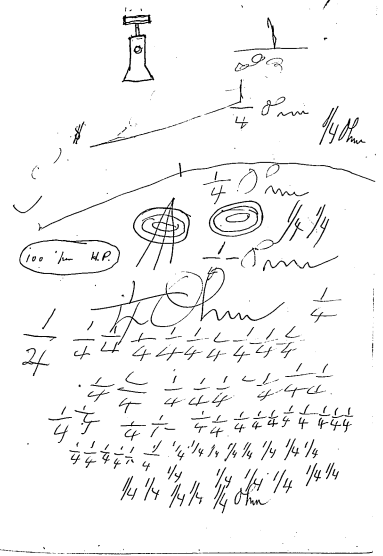
2.74 cts interest per day on $100

2.74	0.4378
24	1.3802
	1.0576

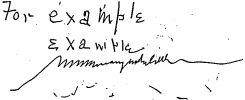
1.14 mills per hour

2.74	
3.65	
1370	
1644	
822	
10000.10	

$10.00 a year



For example



A machine with the same resistance giving twice the E. M. F. will be four times as effective.

In order to do this four times the amount of wire must be used on the armature.

10 miles of wire Aug 12 121

Machines such that 150 Volts can be obtained on 1/4 of an Ohm. Transmitting and receiving machines the same. Receiving machine run so as to have an E. M. F of 100 Volts.

92 % machines

92
84
828
836

84% of energy delivered by the machine in the work

92% of energy in current

That is only one machine enters into the turning of the power into electricity while both machines are concerned in the converting of the power into work.

A machine will cost about

$$\frac{8 \times 9000^2 \times 44.3}{42 \times 33000} = 9000 \text{ about}$$

$$\frac{60 \,|\, 9000}{150}$$

$125 delivered

1/5 of a Horse power used on the magnets

2 machines required to drive the magnets $250

Question how to drive the magnets A wire running ten miles reputed would cost far too much.

If it were driven by two receiving machines then would have to be two transmitting machines for the making expense $500 + 250 = $750

Perhaps best to drive them as a shunt from main circuit

66 machines 9000 Volts

$$\frac{9000^2}{X} \times 44.3 = 12 \times 33000$$

$$X = \frac{9000^2 \times 44.3}{12 \times 33000} = 9000 \text{ ohms}$$

150 ohms on a machine in the magnets

There would be then 120 150 Ohms on each magnet. This could be made less by placing the shunt further along on the line arround say 1/2 of the machines 30,

Then the resistance on the magnets would be $\frac{150}{4}$ = 37.25 Ohms. This would make half of the machines some what more efficient than the rest. But it could be arranged so that the resistance would be arround 3/8 of the machines and these 3/8 made so as to give a greater E.M.F. and thus to balance the loss in the other due to the shunt so that they would take

up this above of the 12[17] energy. The magnets could be made stronger on these machines or more wire placed on the armature.

Any way the magnets can be taken care of by putting ~~more~~ transmitting enough more on to ~~make~~ give off ~~these~~ 12 horse power

Insulation must be so good that even with an E.M.F. of 9000 Volts on the line the leakage will not be 1/10.

The tendency of such an enormous E.M.F. will be to dry the insulation by decomposing any water on the glass.

It is proposed to lead the wires over glass insulators the same as on telegraph poles and it is calculated that the price 25 cts. per ft. will pay for the building the line as well as for the insulation.

One contrivance will be necessary. a governor to cut off the current when the speed is too great. This will be necessary for if the belt on one of the receivers breaks & that dynamo will tend to go as fast enough to equal the E. M. F of all the transmitting instruments.

The cost of a horse power in the motor wheels may be taken as $25 per year.

Ohms 3000 volts active

60 Transmitting 60
60 receivers
120
30 Ohms 30 Ohms

30 Ohms in machines
5 Ohms in conductor
35 Ohms

$\frac{3000^2}{35} \Big/ \frac{44.3}{38.000}$

9000000

comp	35	6.9542
log	44.3	8.4559
comp	38.000	1.6464
		5.4815
		2.5380

345 H.P. Resistance given off

2

690 Horse power in work

Correction

$\frac{1.00}{92} = \frac{2.}{1.}$

$= 1.087$ $\quad 0.0362$

1.174

$2.5380 = \log 345$ or H.P. — resistance

0.0362

2.5742 $\quad 375.2$

$\log 2$ $\quad .3010$

2.8752 $\quad 750.$

1125.2

690 $\quad 2.8388$

$.92$ $\quad 1.$

690 $\quad$ Allowance for resisting machines

8280

552

634.8 $\quad$ 635 Horse power given off

25 Horse power for magnets

1125.2

25

1150 Horse power taken

125
7500

4 Dynamo machines for the magnets 500
60 " " " Transmitter 7000
60 " " " Receiver 7500
Conductor 4500
$ 20,000

Cost of wire

$ 21780 | 4.3381
25 | 1.2979
2.9402

$ 871

5 | 21780
$ 4356

Cost of power

1150
25

1150000
$ 28.750

Cost of machines

4 for magnets $ 500
120 for power
125
120
15.000 Dynamo $ 15,000 Dynamo
Power 28.750 Power
Conductor 4,356
$ 48.106

Say $50000

50000 4.6990
635 2.8028
1.8962

$78.7° per Horse power

60 | 112.5
8.75 Horse power from a machine

page 116 @ 100 @ 10%
1.14 mills per hour
5% for repairs .557
1.7 mills per hour

138

137

1/2 Ohms machines

65 Ohms total

35/65 of House lower as in case with 35 ohms total

7
1150 @ 36 lbs

635 2.8028
.636 1.8037
2.6065

404 H.P. delivered

1150 3.0607 p. 133
.636 1.8037
2.8644

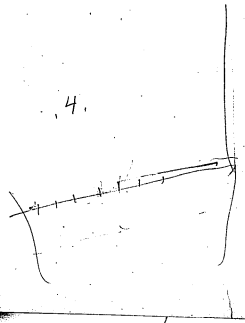
732 H.P. taken

732.02 Water 18300 p 135
$18300 Dynamos 25150
4356
$57406

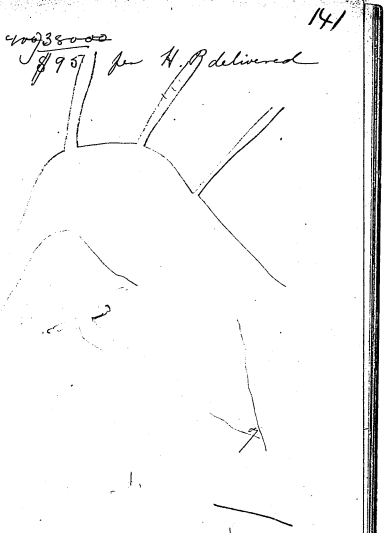
Water 18.300
Dynamos 15.000
Conductors 4.356
$37.656
Day $38000

140

10000
440000



141



142

143

$20.000 for the apparatus
for transmitting 635 horse power
two miles no 2 to return wire
and requiring 1150 horse power to
drive it see page 133
1/2 the power lost in Transmitting

$20.00 $20.000 $20.000 $2000 $20000
$20000 $20000 $20000 $20000 $ $ $20000
$20000 $20000 2000 2000
20.00 20000
20000

1156 : 635 :: 100 : 55

1150 | 63500 | 55% per cent
5750
6000
5750

of power given
to machines received

Interest on $100 $100 $100 $100 $100 $100 $100 $100 $100 $100

	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
250	12000	150	100	90	80	70	60	50	40	30	25 20
6 things a week		10%	15%	10%	15%						
per day											
48 hours a day											
8 hours a day											
10 hours a day											

7 days a week

635) 20000 (31.3
1905
950
635
2150

$31.30 per H.P. for transmitting power

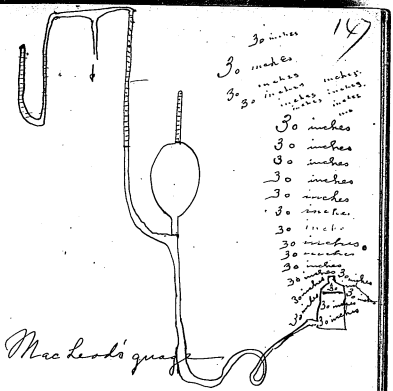
365) 31.30 (
Interest
365) $8.13.0 (8
2920
2100

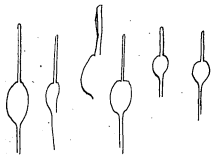
365) 3130 (8.5 8.5 mills per day
2920
2100

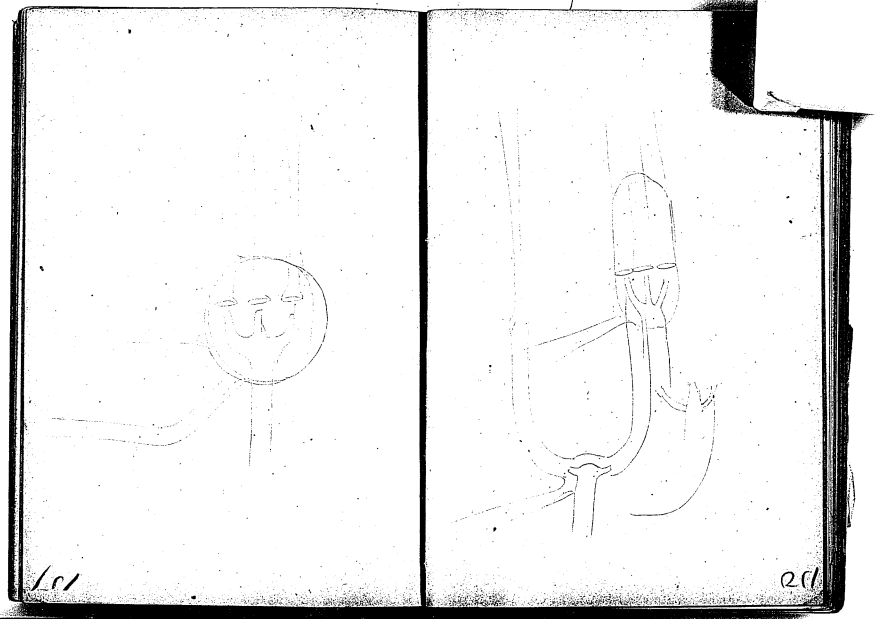
8.5 mills a day

146

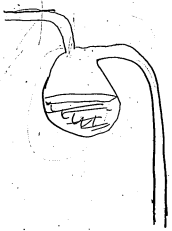
147







27



100 ml 250 ml 500 ml 640 ml 750 ml 800 ml 1000 ml

6 | 27.4

27.4
13.7
411

10.96
1.83
1279

2.74
24.66
12.33
369.9

274
21.92
1.

6 | 27.4
4.57
31.97
30.55
1.42
2397

18.7
2.3
160

274
16.44

124.66
4.11
2577

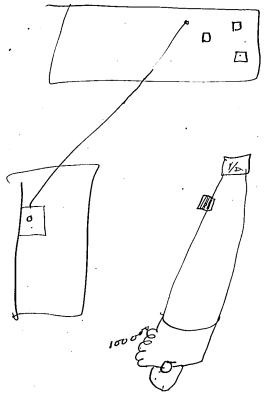
6 | 21.92
3.65
25.57

16.44
2.74
1918

27.4
2.055
2055

158

159



160

161

10 Volts active

10 Volts active

I want a full account of experiments performed

Porchester

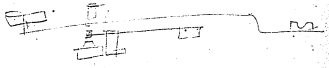
Belcher

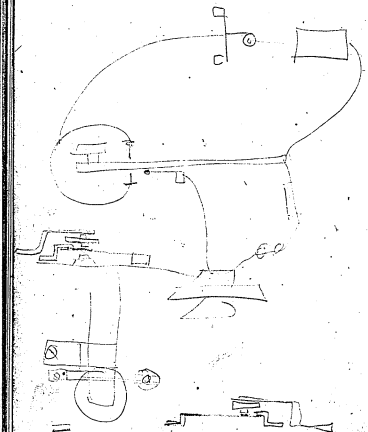
Belcher

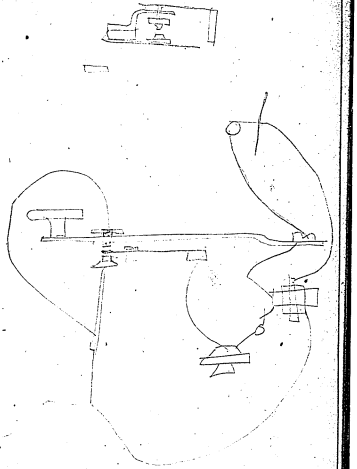
Belcher.

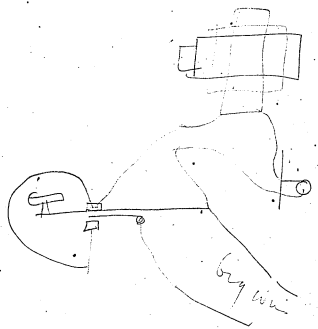
Pure chalk, 1 oz 16 pennyweight,

~~36 penny~~ chalk same pressure always = baker's ~~2~~ 2 lather slow smoothly - fine lines - [illegible] of $\frac{1}{8}$ inch collodium, just resting on chalk but exists no pressure







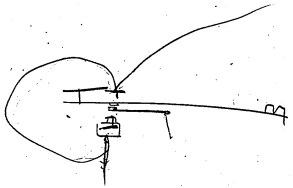


168.

25 ft

450
65
2250
2700
29250

169



10.25

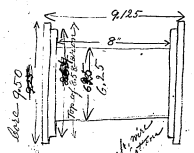
9.70
0.55
10.25

Faraday Lecture No III

Outside Diameter of armature 1.71
— 9.25 over the copper wire

Outside Diameter of iron wire = 8.53

Diameter of wooden core 6.25



Core wire .049 Diam.
.18
.36 Copper .065 over covering

9.25
.72
8.53
3.14
3412
8.53
2556
26.7842 Core.

.030
8.53
26.7842
4501.6 7842 = 59.52 Hours to wind at the bottom
22000
42842
40000
2842
2556
920

86
48.958

4331.25 feet of wire .049 Diameter = .051 Ohms
where the commutator is on, weight of wire
= 31.46 lbs.

Copper wire	.780.	Core	9.500 Diameter
Shellacing "	.060		920
space	.060		8.580 Diam of Core
	.920		

27

1.85
1.50
2.7750

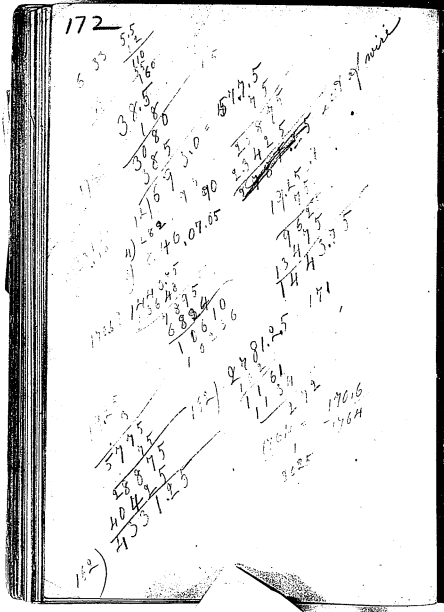
Diam
1150
.065
2.7750

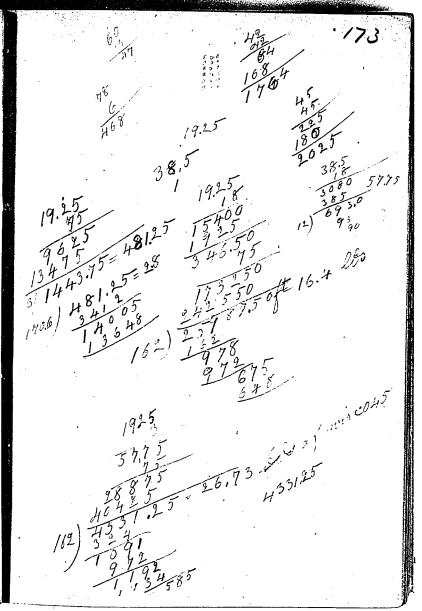
Diam
1.85
2.7750

Diam
1.50
2.7750

Diam
1.50
2.7750

Diam
1.50





Rules 32 lbs of Copper
Wire .0145 Diameter
Double & Compound
Cotton Covered
Nov. 1st 1849

.018 × 2323 = .0417

43 31.25 = 18.645 = .517
23 23
76082
78881
149883
134938
10470
9372
11780
11615

11 18645 = 20.71
64
15
= .517 ohms

.049 | 37.66 | 4331.25 = 31.46 lbs
41304
200885
137808
631790
550472
809980
826608

1320 miles in statute
.049 Diameter
.011 Covering
450
60
27000 miles

215
240
8600
43001
51600
3

176.

9.125
2
18.144
18 1/2
36 3/4 inches

3 feet
4 | 2700
675 feet

4 | 232.3 feet per Ohm
58 | 675 | 12
58
95

Base of Paradic 177
machine of 4 9.218 inches
Largest Diameter of Armature
= 9 inches

1/4 Ohm Machine.

3.1416
9
75 | 282744

1.45133
1.87506
1.57627

.3765

.42
50 | 21
51
6
300

75
12
150
75
900

000
0
.

250

50 | 5
50 X 7
12

3 51

178

.47
3

36 3/4
12 | 36.75
3.06 feet
×75
1530
2142
229.50 feet

2295 feet

2295 feet / 4 Ohm

.065 in. diam

$(.065)^2 \times .314 = .0133$

$\frac{408.7}{.0133} = \frac{2295}{x}$

x = 12.40

.1745 the Cross section to have

1/4 Ohm

.8129
.8129
.4967
2.1227
408.7
2295.3608
2.1227
2261.13
40946
1.9835
2.2611.3
1.8722

3.1416
8.5
157080
251322
26.76300 | 356
225
426
378
510

.356
178

150 178

.062
.062
124
62

250
25 30

47/3

.047
3.14
.047
2198
1256
1.47580

147
9

147
6

180

250

~~15~~ .200 / 26.763

133.8

134

67 commutators

.200
.250 | .050
.011
.039

67 coils

~~2.95~~ 3.06 round

3.06
67
2142
1836
204.502 feet of wire once round in each commutator

.1 in diameter 967/4 feet = 1/4 Ohm

24.175 / .1 = 205 / X

181

20.5 1.3118
241. 2.5832

2.9286

.0848 decimal Area of wire one turn to a coil to give 1/4 Ohm

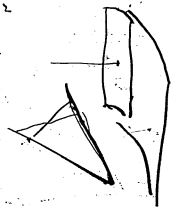
√.0848 = .15

2.9284
.4983
2.4301
1.2150

.164

WR^2

.328 = D



182

2 Volts

.1

4 | 2.1

.5

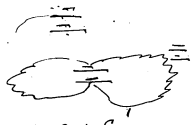
183

78

63

1.13

4 | 1.7 6



$C = c + c$

$\frac{R' + R''}{R R''} = 4.4.$

$C = \frac{1}{R'} + \frac{1}{R''} =$

$R = \frac{R' R''}{R' + R''}$

63

1.13

63

339

678

.7119

.711 T. 8519

1.76 0.2455

T.6064

4

.40.4

3 inches .016

3 inches .010

3320 ft. lbs. per H.P.

16
16
256
100

15 06 ft lbs : 10 candles

40 3000 ft. lbs.

surface .1

3340

33000

~~33000~~
~~Lamps~~ 44.7
100
~~Candle Pwr.~~

2
4.51855
1.6464
4.87221
1.1461
3.7260
1.8630

73 Volts

1.8633
1.8633
1.6464
1.1461
8
4.5191

75
75

75 1.8757
75 1.8757
443 1.6464
5.3966

249000
2490

Double the energy on the same surface quadruple the light.

1/2 the surface, and 1/2 the energy 1/2 the light

1/2 the surface same energy 2 times the light

~~30 sq ft. the surface~~

~~Lamps to one~~

Lamps with 50 surface
10 lamps 10 gas jets
10 lamps 20 gas jets

188

63
4
192
(2.
106

4. 8
8
64
44.3
64
1772
2658
06 (2835.20
1

189

15 lamps

15 lamps
15
15)20(+14
15
50
70

14)20(1.47
14
60
56

14
16
84
14
224)33000(+1147
2248
1068
896
1740

190

.100 in diameter

967.5 feet make 1 Ohm

242 " " "

$$\frac{242}{(.1)^2} = \frac{2295}{x^2} = \frac{242}{.01}$$

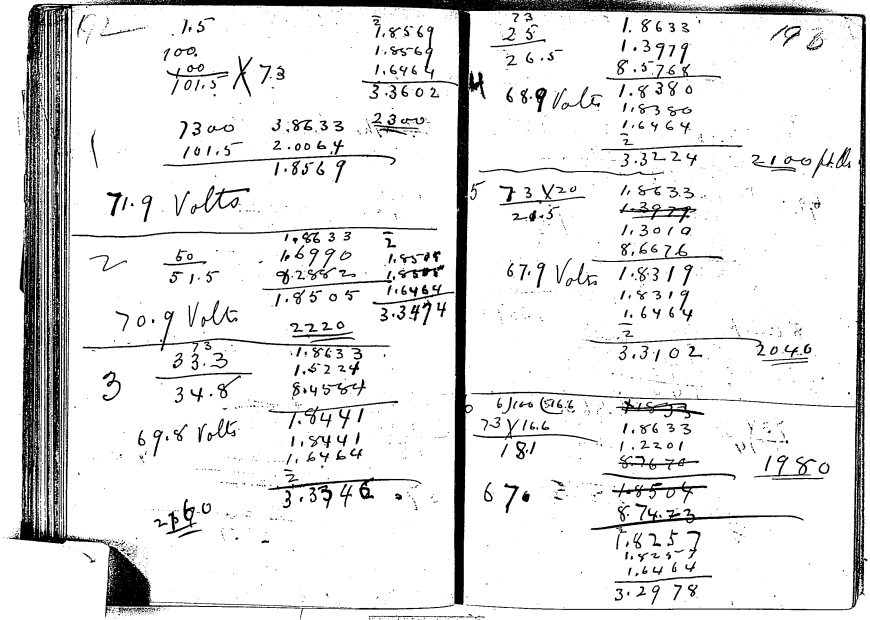
2295 | 1.3606
242 | 2.383
2977
1485

.308

191

$$\frac{242}{.01} = \frac{205}{x^2}$$

Machine 8½



19 4 lamps 7/100

14.3

1.5

15.8

73 1.8633

14.3 1.1553

15.8 8.8013

1.8199

66 Volts 1.8199

1.6464

2

3.2862

1930

8 lamps 8/100

12.5

1.5

14.0

73 X 12.5 / 14 = 1.8633

73 10

11.5

63.5

12

1780

3.36027

3.36027

6.72054

6.5032

.2172

2.8633

1.0607

1.8026

1.8026

1.6464

2

3.2516

3.2516

7

6.5032

1.65

16 candles .2041

.2175

.9866

195

196

73 | 100 / 101 | 7300

7300 · 101 = 3,86633 + 2.0043 = 1.85990

72.4 | 1.85990 + 1.6464 = 3.36644

2308

---

50 / 51 | 1.86633 · 1.7 ×

71.5 | 1.86633 + 1.8990 = 8.2924 | 1.85547 + 1.85547 + 1.6464 = 3.35558

2266

33.3 / 1.0 / 34.3 / 69.6 | 1.86633 · 1.52224 = 8.43584 | 1.84441 + 1.84441 + 1.6464 = 3.33346

1.86633 · 1.52224 = 8.85585 | 2.24 42

160

---

73 | 33.3 / 34.3 | 1.86633 · 5 1.85 · 1.52232 = 8.46339

70.8 | 1.8504 + 1.85504 + 1.64664 = 3.34472

2276

---

73 × 25 / 26 | 1.86633 · 1.39779 = 8.5880

70.2 | 1.84462 + 1.84462 + 1.64664 = 3.33388

2182

---

73 × 20 / 21 | 1.86633 · 1.3010 = 8.6778

69.5 | 1.84221 + 1.84221 + 1.64664 = 3.33306

2141

197

198

73 X 16.6

17.6

688

2100

1.8633
1.2201
8.7545
1.8379
1.8379
1.6464
3.3222

1100
16.6

1100
12.5
13.5

67.6

2023

1.8833
1.0969
8.8697
1.8299
1.8299
1.6464
3.3062

10
11

66.3

1957

1.8633
8.9586
1.8219
1.8219
1.6464
3.2902

3.3644

.7288
6.5804
.1484

16

1.2041
.1484
1.0557

3.2902

65804

1.4

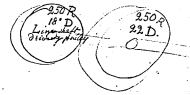
144 D. of Wh.
55 R. of Engine
720
320
46)7920 inches per rnt.
46 = 172 R. of Shaft
332
322
100.

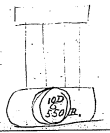
18"D Counter sh. 229 Faradic 10D 505R

144 D. Wh.
65 R. Engine
720
864
46)9360 inches per rnt.
160 = 203.5 R. of shaft

18D Counter shaft 271R Faradic 10"D = 576

472 each R. of Eng. = to 3.13 of shaft
60 R. of Eng. = .188 of shaft





188
O
24

230.4
18

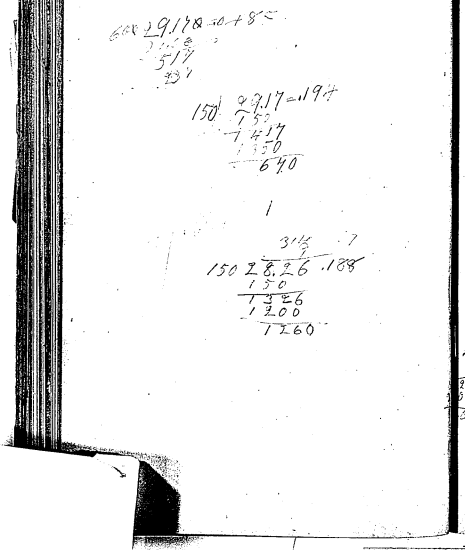
M 172
C. 229.3
F 550

250
24

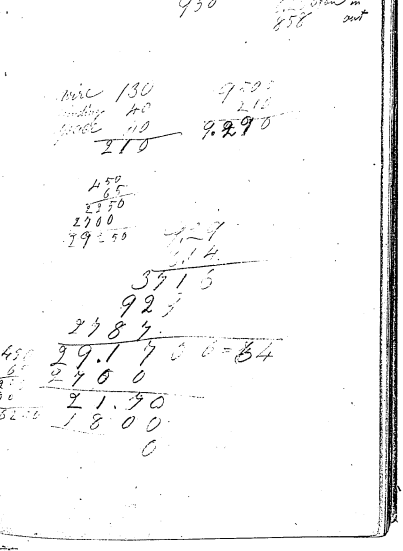
M

M 203
C. 271
F 650

6016
10



950



9.500 bare
40 space
40 Binding
47 wire copper & [illegible]
174

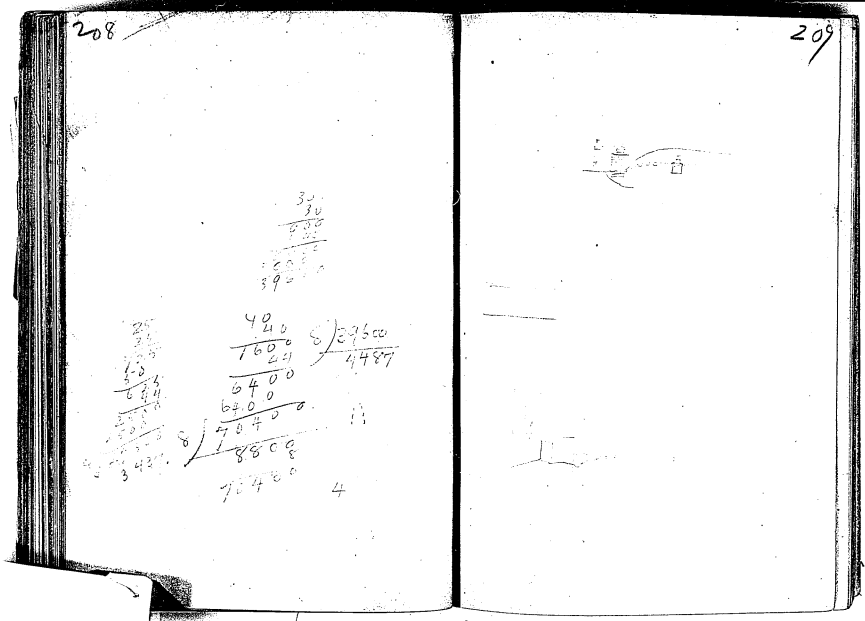
9500
174
9326

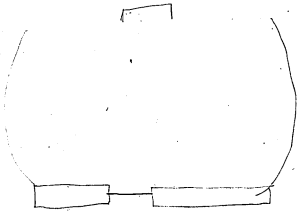
40 9490
20 1744
94 9.326
174

Outside Diameter of iron wire = 9.290

Nov 28th 99

Wind iron wire upon to
9.328 Diameter
Fibre ends 9.490 Diameter
Cutter for Fibre .188 wide
Thickness of Tooth .007 on Tap





212

213

840

2 | 3360

1680

1640

25

220 7630
220 0565
110 7.0652
40
20
10
5
1
.168

5
905
44
59

Nett Machine

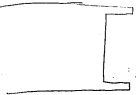
Diameter of wooden core 6.25"
Distance between iron flanges 8.25"
" " fibre " 8.75"
Iron wire .075 square
Diameter over iron wire ~~when~~ 9.05
" " Core 9.65
" " Fibre 9.55

39 1/2 " per Quadr.
12 squares
= 39.5 ft. per Coil

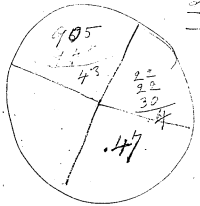
45 Commutators
1884 ft. per coil
1884
12774
10685 = 15.84
2089
9370 15.84
15150
13118
2032
1884
1580

1/ 15.84 - 2) 3964 = .44
27
32

450
55
2250
2250
24750



905
910
3620
905
2715
28.41 70
24.75
150 3.06.2



2475 = 2725
455
2270

Faradic Machine No 3 D
Jan. 5th 1880

215

Diameter of bare	9.45
" " Armature over all.	9.64
" " " drum	9.19
~~" " Pole Pieces~~	~~9.37~~
" " wooden bare	6.25
" " shaft	1.625
" " brass box outside	
" " " inside	1.25
Thickness of Cast iron for Frame	.168

.150 Divisions

Faradic Machines 5,6,7,8,9,10,21
Jan. 5th 1880

Diameter of bore - - - -	9.75
" " Armature overall	9.67
" " " " Brass	9.19
" " Wooden core	6.25
" " Fibre ends	9.67
" " Shaft	1.75
" " Brass Box outside	2 —
" " " " over flange	2.50
" " " " inside	1.50
" " Pulley	10 —
" " " over flanges	12 —
" " Commutator	5 —

Shafts marked 1 have large Bore & Tin fibre
" " 2 " Small " " "

22 2

Distance from base to centre 22.5
" between wire ends 5.75
8.75

Length of bearing 5.75
" " shaft total
" " " between bearings
" " " from ends
" " " " heads

224

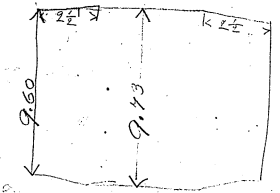
April 22 80 225

Dynamos Nos from 10 to 22

Diameter of bore 10.25

" " Fibre 10.19 10.17

" " Iron core 9.70



Shafts marked 1 have large cap & thin plates

" " 2 " small " " "

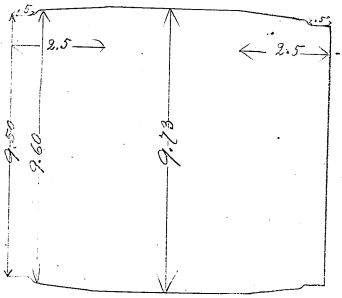
FS Derby 227.

230

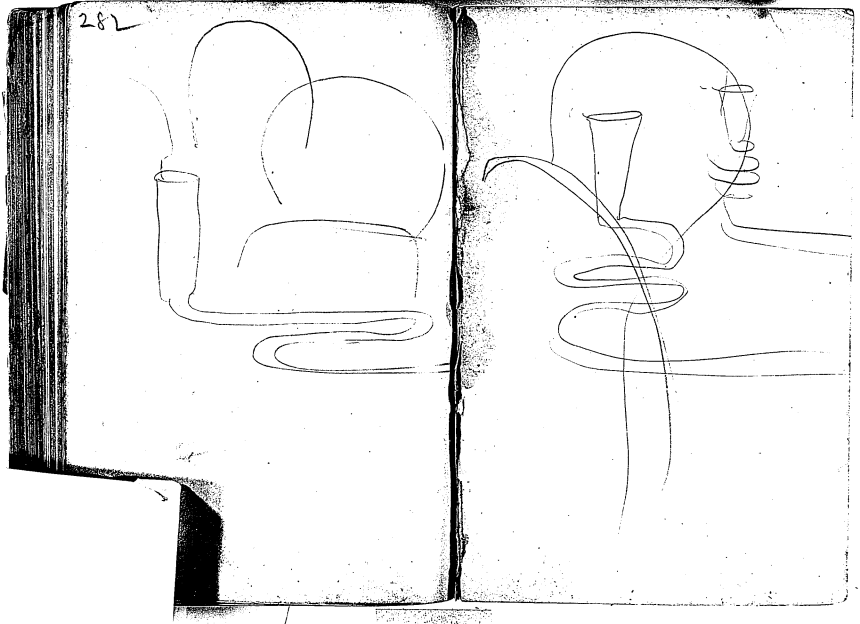
231

Dram Carey

Mabi. No 15. 16.17.18.20.21.



April 20 1960


282

Menlo Park Notebook #80 [N-79-06-12]

This notebook covers the period June 1879-September 1880. The entries are by Edison, Charles Batchelor, John Kruesi, and Francis Upton. Most of the material relates to electric light or telephone experiments. The electric light material includes notes, calculations, and drawings of generators; drawings of filaments, bulbs, and sockets; and notes on equipping the Menlo Park lamp factory. The telephone material includes notes and drawings relating to telephones, central exchange systems, and chalk experiments. There are also notes on ore separation and notes and drawings of the electric railroad. The book contains 282 numbered pages.

Blank pages not filmed: 60-63, 94-95, 114-117, 134-135, 188-189, 198-199, 206-243, 246-247, 250-255, 258-261, 266-269, 272-273, 276-279.

Missing page numbers: 165-166.

Do so

Experiments on Chemical?

Ice pheone June 12 1879.

Connections

Tuesday end.

8 H.P.

500 turns 15 ft 2500 ft per hour

gas 70 c ft per M

= 175.

8 H.P. 500

62

No 80

LIBRARY OF THE

BOARD OF PATENT CONTROL,

120 BROADWAY, NEW YORK.

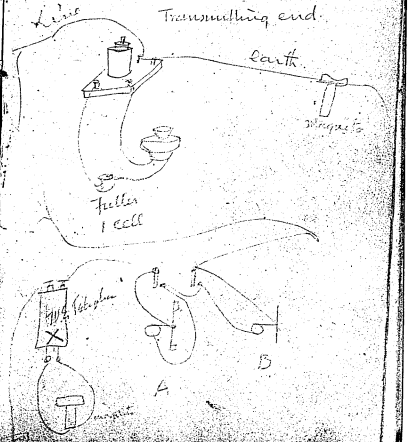
, 189 .

Experiments on Chemical Telephone June 12 1879.

TAE

Connections

Transmitting end.



June 12 1914 Gal 3

When A is in only & X is out it is exceedingly loud, when X is in it reduces it to ¼ of the volume —

When both A+B are in the cutting out of X does not materially alter the volume of sound

---

I have just found a way of large dimensions which is that sometimes when B is cut in [illegible] sound can be heard in A at other times [illegible] no difference, this phenomenon must be due to polarization.

June 12 1879 TAE

I find that with 2 chalks
the current that will
polarize one will not
always sufficiently
polarize the other hence
one chalk will be loud
& the other low, If the
battery is increased so
as to overpolarize both
the Chalks may have
the pressure increased
on one & decreased on
the other & the will
bring them OK so
that when
one is taken out of ckt
the other will go low
owing to increase in

June 12 1879 Tap

Strength of polarizing Current ~~too~~ when this very low the insertion of the other cheeks makes it loud again as it weakens the polarization Current, On the other hand when one is out & the other is over polarized & low increasing the ~~less~~ pressure on the spring so that it will do as before & loudness will be nearly restored

June 12 1874 TAE

Just tried experiment of putting induction Coil in line (10) its primary coil of 40 ohms resistance & putting the chalk in a local formed of the secondary of 500 ohms & worked quite loud - & inserted the other chalk right in the line & it did not make any difference but putting in the induction Coil of 40

June 22 1879 Tag

regular telephone ||

X lowered & greatly
improved by putting
Carbon Transmitter in
line with 4 Co Cells
Carbon battery
placing primary of
induction in ~~Coil~~
line & putting Chalk
in receiving Speaking
that you can ocasionally
hear it with 100 ohms
in circuit with 4 small
Carbon Cells in line
with 12 ohms it is fair

June 12 1899 TAE

We not use 1 cell carbon in Line & found the transmitter & conduit to see effect. It works (one cell) but 12 ohm rheostat makes it Cosy —

We now wind 4 layers of 23 wire on the outside of the induction Coil forming a tertiary coil in the circuit of the wire we put the choke & following Gaither & Lincoln coil & find that it comes strong & loud in fact as loud as the old way when both induction coils in also

June 2 1879 Tel 13

That 12,500 ohms may be inserted in the line & it is still receivable over a fair day's work. Then would 6 layers of No 3 wire on a [illegible] Bergmann Coil for a Telephone & find it as loud, this ex to Resistance over that which is [illegible] by a 23 wire from the Chalk ckt shortened the induction from the Coil to the talking — The greater the resistance that can be put in this Telephone & still work

June 21 1894 Thurs

land the better it
will be when harvesting
for the other way —
By this means we make
each Chalk reservoir
entirely independent
of Everything else & have
a perfectly Constant
Calcareous effect
Chalk we can use a
Chloride of Calcium &
to salage the Chalk
this will prove
Last 2 years

We propose to do
away with the cumbersome
system through
the Board in
little Multiple Factory =

New Business

Carb Barium 1st class
"
" Gypsum -
Chalk Hyd Sulp Magnesia "
but not proceed -

Salmon Ko 0-41/2 class Mfg

Slaked lime. June 12 1879 Tor
Too rough. unsuitable -
grind for Calcium - ng

Common Salt - good
st. clear
Hg + $CaCO_3$ -

Platinum - We found that
it want a very slight
Current to polarize the
Salt Cutter if Battery is
too strong it is too
irregular scarcely readable
which is with shunt polarizing
cell down to 1 ohm we get
it loud & clear -
Lake & shunt & it low &
very irregular.

2 Hrs. probable that Every Solution will require a different polarizing Current Chalk seems to require 3/4 or 1/2 Daniel Salt 1/20 of a Daniel roughly speaking -

Common Salt. Best Better than chalk; melting point 814° C - it will work very near as Low without polarization -

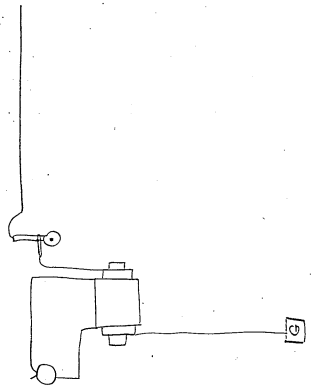
Sulphate Baryta - grams 2.4942 -

Fust Class - negative

just 1 coil Daniel for polarization = ~~2~~ 2 ~~of~~ 1 cut off 1st time ~~but~~ full loudness without coating — ~~coat~~ afterward ~~coat~~ coat it & for 20 to 30 seconds 10 minutes too great polarization because it was too hot & conductivity about two thousand ohms —

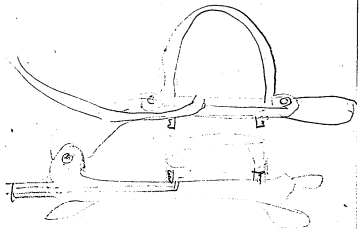
26

27



28

29



April 15 - 1879 pm

Final test of Chalk June 27, 1879.

Chalk Lithia - chalk soft

Chalk - Ferrocyanide Potassium good ½ hardness of Eng. Chalk - perhaps 2/3 hardness

Chalk Tartaric acid just the slightest faint cast round

32

Chalk. Pulphate of Zinc. 5 3
Irregular Low. July 5 1879

Chalk Iretate of aluminum
Low

2 oz Chalk
1/4 oz caustic K O
Cannot see any difference
between the regular Caustic Na O
or K O. Lond and clear

Chalk Iodide of Potassium
Very low

Chalk Grape sugar
very very low

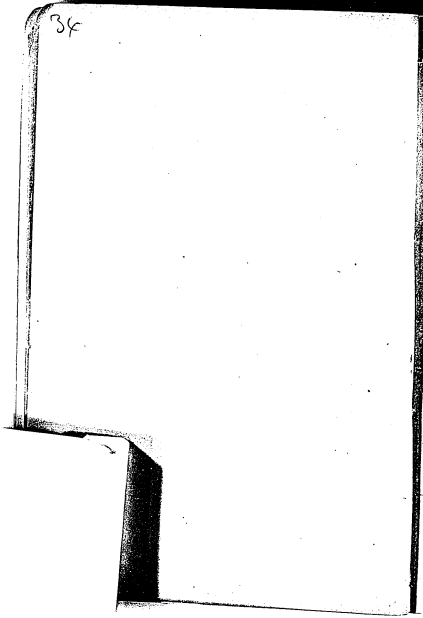
Chalk permanganate of K
very very low

Chalk Sulphate of Cu
very very low

Chalk Three drops Ferric Chloride
10 " Chloride of Calcium
very ~~very~~ low

Chalk Nitrate of lime
pretty low

Chalk H_2O 15 drops of
acetic acid.
N.J.
Forms acetate of Ca



Chalk Bichromate of K 37
fair, not very bad.

Chalk H_2O ~~Rest~~ and 4 drops of Ferric Chloride
M. G. June 15 1894

Chalk 1 1/2 g, and 1/2 oz
Neutral Sulphate of Soda
As good as regular
solution saved

Chalk Nitrate of Zn
very very very thin

Chalk Tartrate of Soda
very low

Chalk 1 oz Caustic Soda
20 drops Silicate of Soda

Put in 20 [illegible] regular
2/3 oz bird [illegible]

Chalk [illegible] extremely [illegible]

Chalk Phenolic acid
very very [illegible]

Chalk very weak solution
caustic soda

Cure 1/4 bird regular

Chalk wet for 1 1/2 hours
laid out for 8 hours
4/5 of regular.

40

July 4 1879

Phosphate of Lime 1/4 oz saturated
Chalk 2 oz
Moderately wet

50/200 .40 Daniells

.05 Daniells constant on line

Very wet .35 Daniells

.07 Daniells constant on line

not quite as loud as regular

Regular soaked 2½ minutes
.4 Daniells ½ oz quinine
.075 constant
very loud

+2

Nothing July 4. new [illegible] on a [illegible] 43
regular, baked hard but
when dry fair

Wet fair but irregular
made the shuttle jump.
scraping made it harder

Soft regular
Putty fair

Old regular which was used
yesterday smooth fast I will not
work in apparently too hard
Hard on gloves outside soft
inside.

Edison telephone July 7th 1899
5 AM.

At 2 pm July 4th Edison and Batcheller were experimenting on chalks and put away on shelf 2 chalks for test one was

No 1 — 2 oz Chalk
¼ fluid oz Caustic Soda
Hard pressed

No 2 was — 2 oz Chalk
¼ oz Phosphate Soda

At this time they both looked alike

July 7th 1899 5 am
the No 1 was almost played out
the No 2 was very good not quite so loud as we have heair but loud enough for regular work
No 1 was wet
No 2 was put away again on shelf.

See page 49

46

Edison Telephone
July 7 1879
Charge Battery 5 AM
2 oz Chalk
1/4 oz Caustic worked good on July 4 2 p.m.

Soaked 2 days in a 10 pc. Solution of Caustic Soda
Left out tile now to dry.
July 7 5 AM Worked exceedingly loud and clear.
Testing her was will 340 tertiary

July 9th 1 AM 1879
1/4 loudness and uneven, much lower than No 2. Page 49

July 10th 4 AM
1/2 loudness

July 16 2 AM
Edison just hears it at daylight
No effervescence

from page 45 Characteristics

No 1 by wetting came up to about $\frac{2}{3}$ th original loudness.

July 9 1AM

No 2 came as on 7th this is simply wonderful

put away again on shelf

No 1

same loudness as No 2

put away again on shelf

July 10 - 4AM.

No 2 about $\frac{1}{2}$ loudness of yesterday

No 1 about $\frac{1}{7}$ loudness have to put your ear down to it

55

Edison telephone July 7 1899 37

5 A.M.

Chattanooga Tenn

2 chalks wet with ¼ Phosphate Soda were made on July 3 and have been out on the shelf ever since; when put in telephone worked well and pretty [illegible] loud voice

I left one shelf after trying the other was left on shelf to soak in solution of Phosphate Soda but crumbled down in the solution

July 9 1899 1 a.m. The one left was fully talking good without any time being wet

Put on the shelf again to wait

July 10 4 a.m.

Shell talks good but pretty low

52

Edison's telephone July 7th 1879

5 AM
Took a receiver
Made a regular chalk July 3
at 2 p.m. and put it to soak
in 10% solution of Caustic Soda
with top out
at 5 AM July 7 it was tried and
worked half loudness

July 9 1 AM tried again
very low Edison could hear
it at all unless he put his
ear right down on the drum.
then it is quite loud to him

July 10 4 AM
about same

5-4

July 15th 2 AM frompage [illegible]

1/4 to 1/5 loudness 49

when he talks 3 inch away we can hear it a foot away

Edison wipes the efflorescence from No 1 before using

1 1/2

No 2 about 1/6 loudness

Edison hears it 2 inch away — No efflorescence

Inertia telephone was here put in and it did not work quite so well as our ordinary transmitter but when Edison wore out No 2 with water it worked a little better and afterwards came out nice and loud

J-C

July 16 1879
2 AM

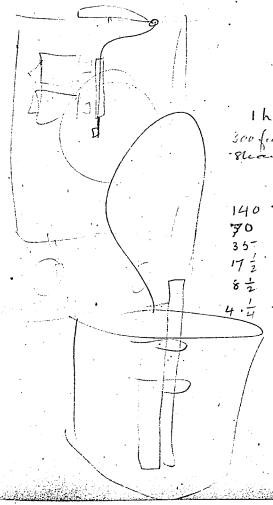
Chas Batchelor

Quentra telephone this telephone works excellent and does not require adjustment even when you shout in the diaphragm

58

July 17 1874 fcb

59

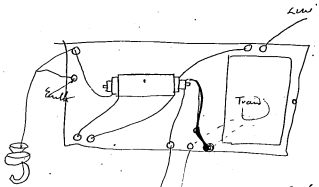


1 hp.
3 sq ft 1 inch steam pipe

140 sqft	150
70	300
35	600
17 1/2	1200
8 1/2	2400
4 1/4	4800

64

65



July 25
1877
Tues.

120.

Separation of silica from Gold & Copper by dissolving the gold...

May 1880

60

13

3 9.

33

.6

.1.

13

26

S

12½

100.

266

190

124 266
124 67
1362
1596
17822
3427
2565
542

30.19 14½

36 - 5

55 55 124

35 2/3

226.5 1/4

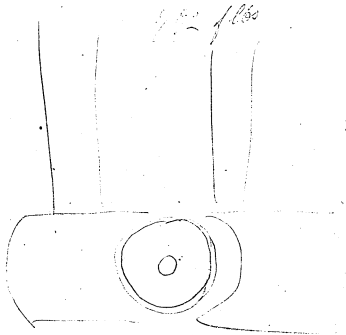
2285 64
65304
55.16 0 12
55.12 12

1389
·81
1389
111 2
·81

17639
8816
10589 2

10558
1148

125.19



88.

$$9255 : 005 :: 01740 : 94$$

$$X : 005 :: 01740 : 94$$

$$94 : 01740 :: 005 : X$$

$$94 : 01740 :: 005 : 1740$$

$$9255 \overline{)94} \quad 1740$$

$$1740 \quad 94 \quad 1740$$

$$94 \quad 1740$$

$$18.44 \quad 18.44$$

$$220.00 \quad 18$$

$$94$$

$$1740$$

$$94$$

$$94$$

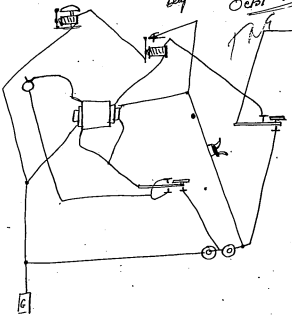
$$1740$$

$$94$$

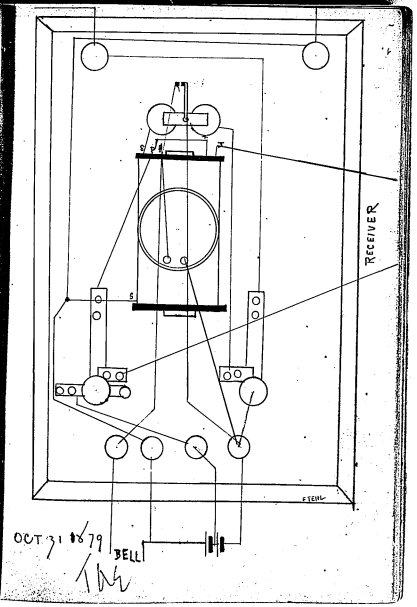
$$94$$

$$94

Telephone Connections
Oct 31 1919

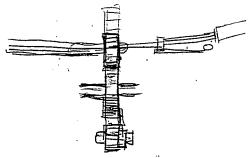


74



76

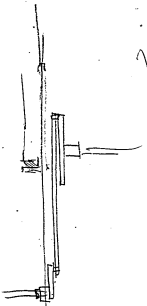
77



Oct. 31 1871

78

79



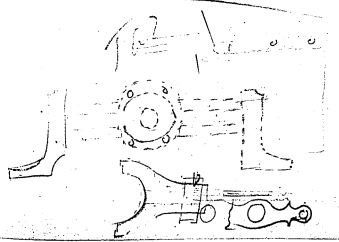
Dec 28th 79.

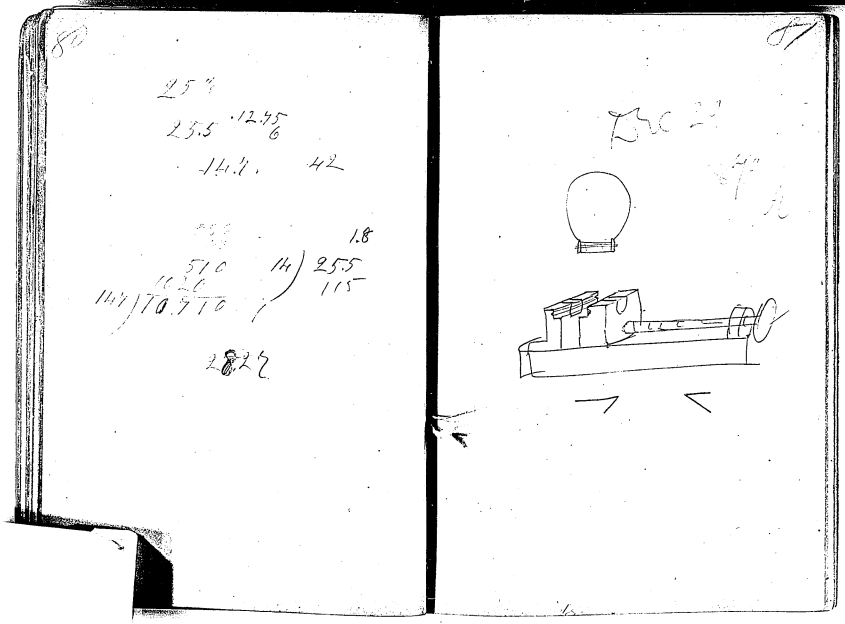
Boring No 2

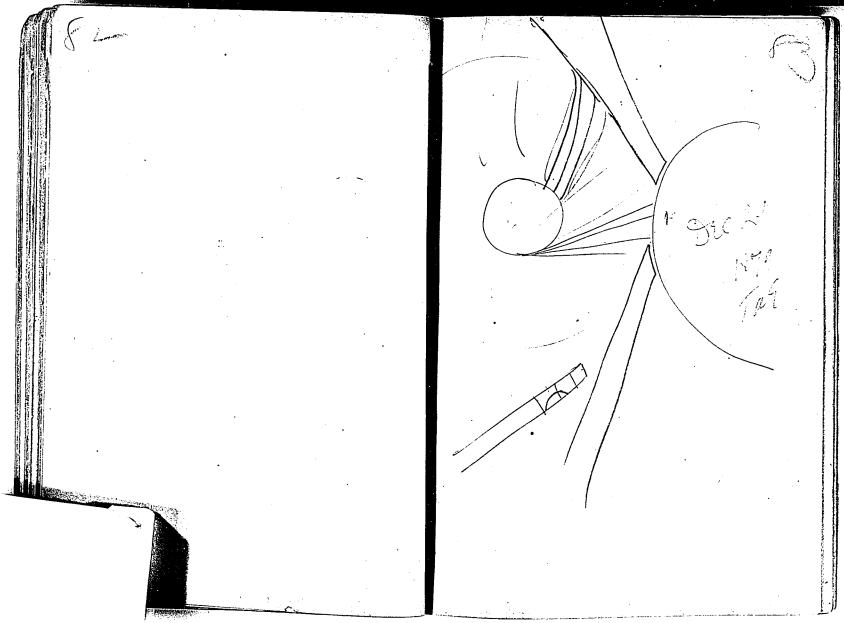
Intake Diameter of drum wire 9.05

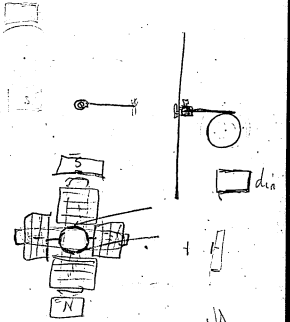
Diameter of piece 9.28

Diameter of bore No 2 9.65



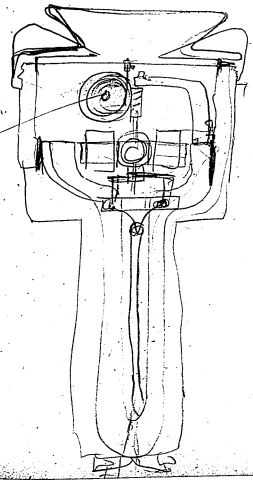




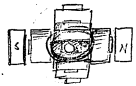


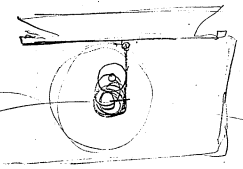
Dec 24. 1879
Tar

Dec 29 1879
Tar



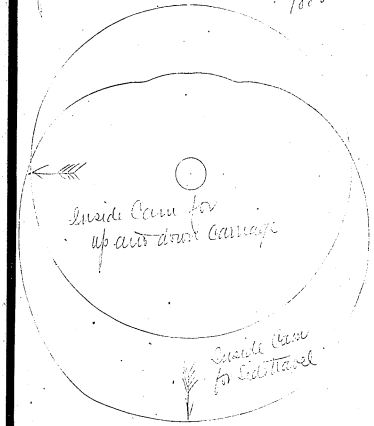
Dec 29 1899





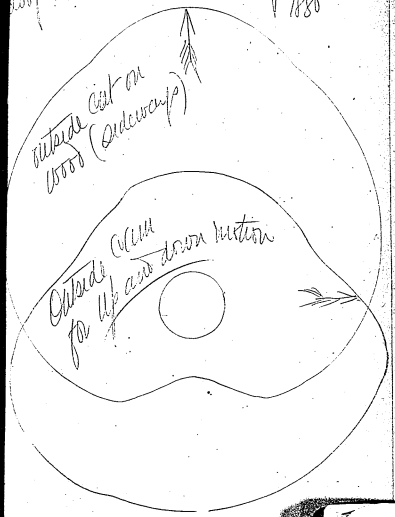
Dec 24 1871

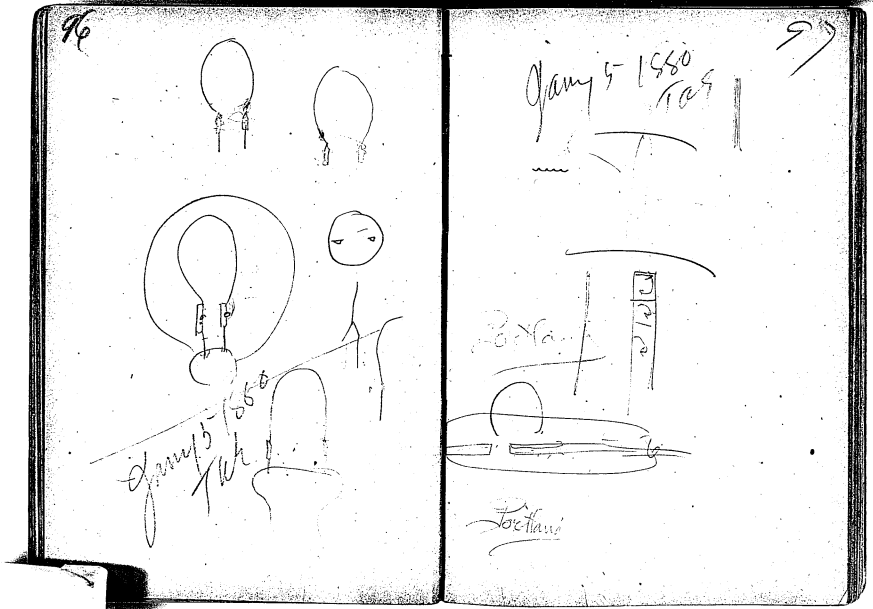
Log making machine April 20th 1880



92

Corp. making machine Apl 30 1850 93




96
97
Jany 5 1880
Jany 5 1880
Tue
Tue
Lecture

98

No 1 Good

" 2 NG

" 3 very good & durable

" 4 a little better than

" 5 Brass wire brush result in this position same as under No 3.

" 6 N.G. Brass brushes little work but very little impression all the work was thrown on the after washing

Experiments 99

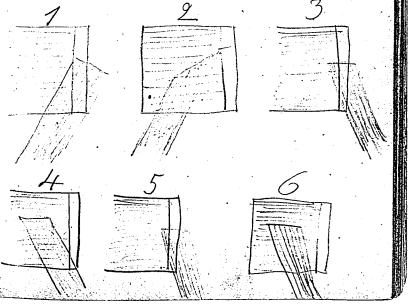
on Rubber Tests

1880

J. Thurber

TRE

We found by turning the brush out at right angles to the commutator the sparks disappeared & obtained for the following experiments



100

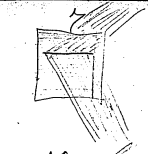
Very very nice brushes. Fast
Making all over the
Board clear
near as good as 5 3
& 5 wears off fast all work
shows on this mach.
8 brushes
very good copper

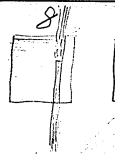
9 Narrow brush same 5
Little sparks but no current
mach

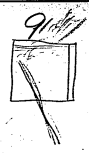
10 same brushes
Does more work
Sparks on the 5 has much
equally as good than 3 & 5

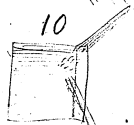
11 same brushes as in 7 (wide)

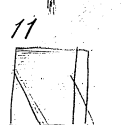
12 same brushes as in 8.9 10 but
contrary angle very good Does more
work in 1/2 time other mach without
sparking

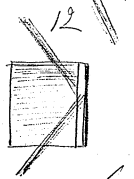










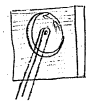


OK very good standard

Current direction
to the wire only
390

102

14



NG

Feby 6 1880

for

103

1

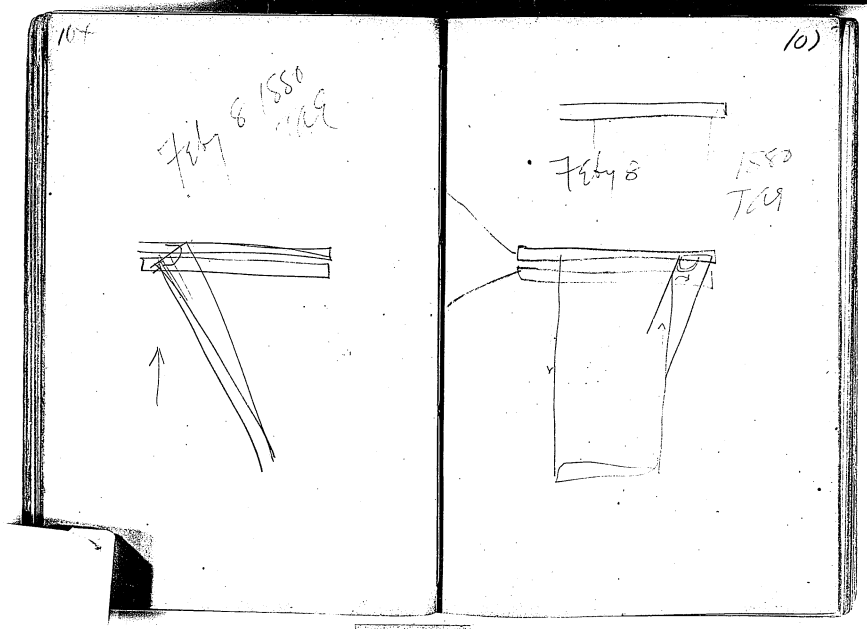
34

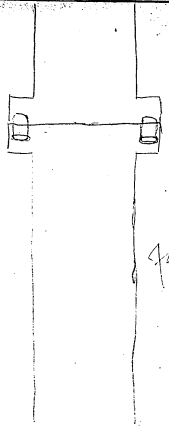
16

410

1450

3


104
Fabry & 1550
TEM
101
Fabry & 1550
TEM



Feb 8 1880
TAE

Feb. 10th 1880 107

Experimental Armature
with sheet brass post on end.
spiral ◎ 80 ft. No 32 wire

Very bad.

TAE

March 9th 1880 109

Temperature at the start 19°

Number of Lamps on
machine No 6 = 75

65°

T.C.

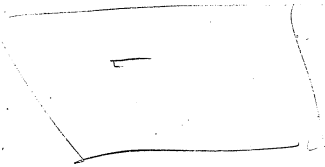
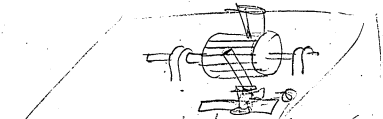


Table 8 oz. Tray of Cake
[illegible] must be accompanied
[illegible] with 30 Cts. Postage
of Doctrine matter.

For [illegible] Chairs Table 1¾ oz 8
2 Dishes

Sept 3d 1882

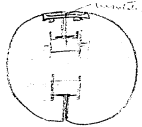
Model



See page 99
This book

May 6 1880 Fair

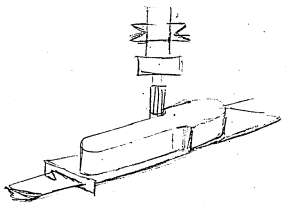
Idea, little electromotor cause shaft
with arm on a track on pipe track
being Compared at ends



120

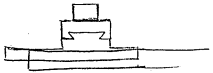
at Weight Cutomers,

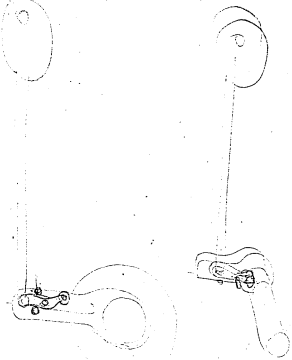
121

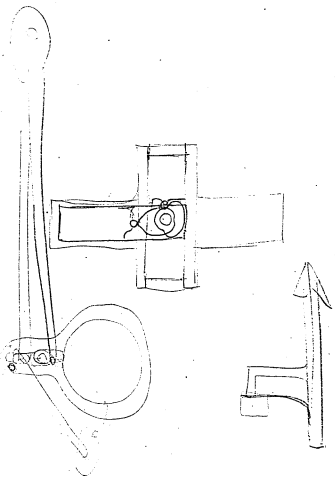


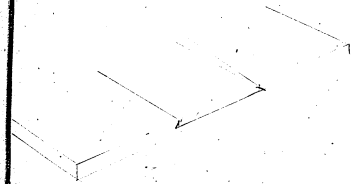
May 6 1880

Porter can make us a pair of small Engines to work two magnets, Each with Cranks & The Current from one Bunsen Battery going all the Coils in one Circuit of Wire, & the other to a spare, We have a Lever Connected with the Governor so that any required speed may be obtained with the Engine. Hence we can regulate the Clock or Chronometer or Chronometers driven by Varying the speed of the Engine,





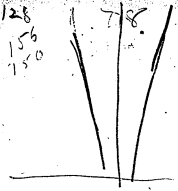




128

156

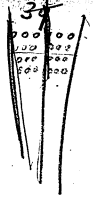
150



78

60) 100 (166
60
40
36

15) 166 (11
15
1



36

78

129

156

736 15-1680

15
20
3.00

60

7) 16 (86
56
4

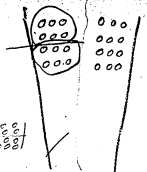
60 H.P
8
48

14

1160
55
48

1 H.P 3

130



Jan. 20 1880
Mr. Upton's calculation

4/56
.14 ohms

39 commutators
2
78 cuts
2
156
150

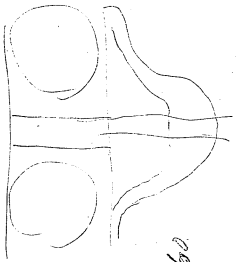
75 commutators.

131

600
750
800

7 by 15 T&C
T&C

600 120 Volts
1200 120 Volts



63

132

35 light

~~to~~ 1/4 light

70 2

35

7

146

2000
200 2000000
200000

2000

133

3. Shine

6 to 1

6 .1

1 .1

1

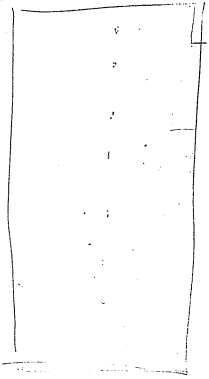
18

125 22,000
250
2200

125 2

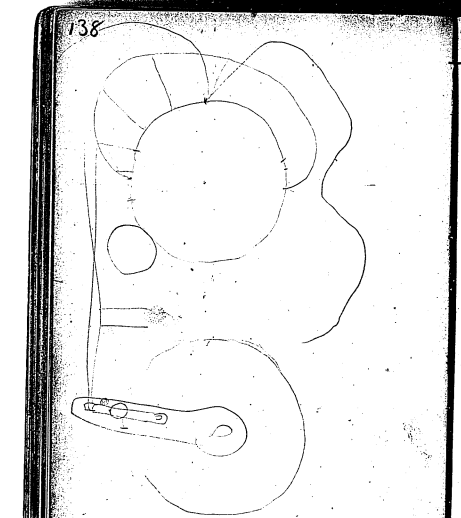
58 22,500
125
7100 FT

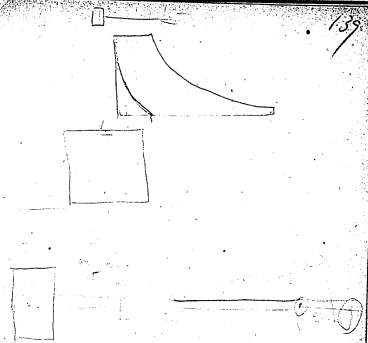
125
250
250
58 14500.00 #7620
232
1.30 58 #7620
466
350
120
670

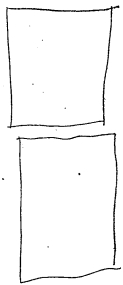


75'

24

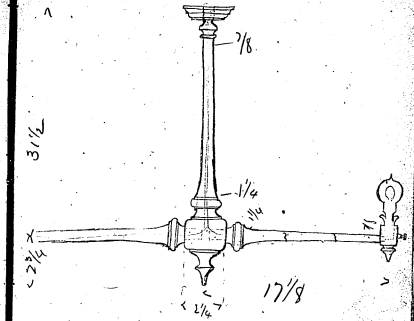






142

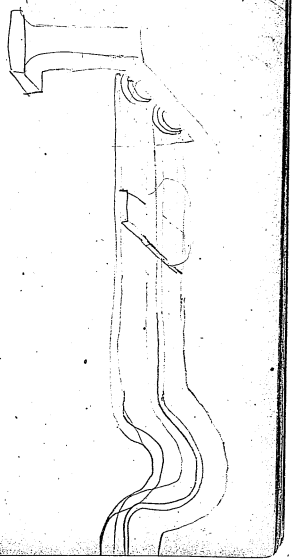
143

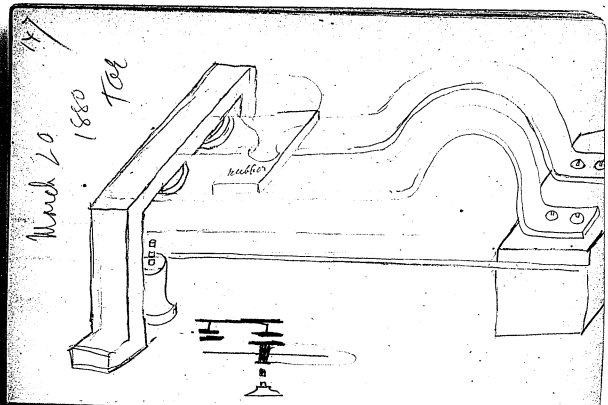


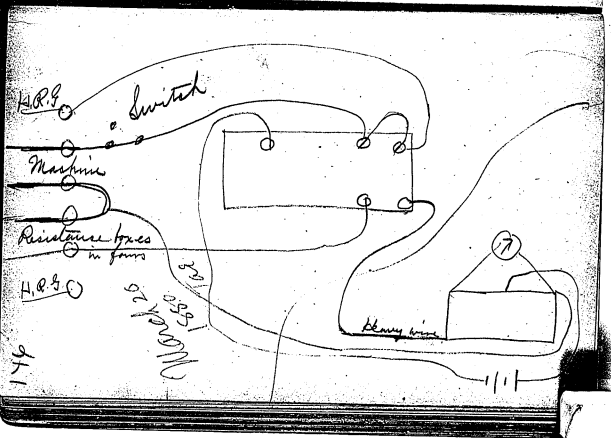
Feby 20 1880

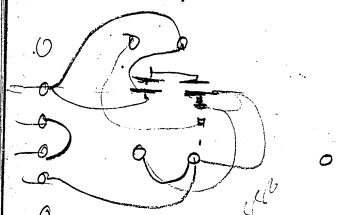
144

Circumference 10 ft 1/4"

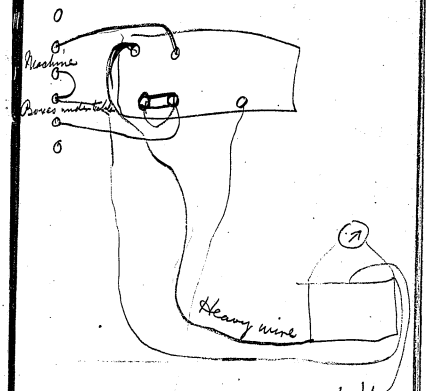


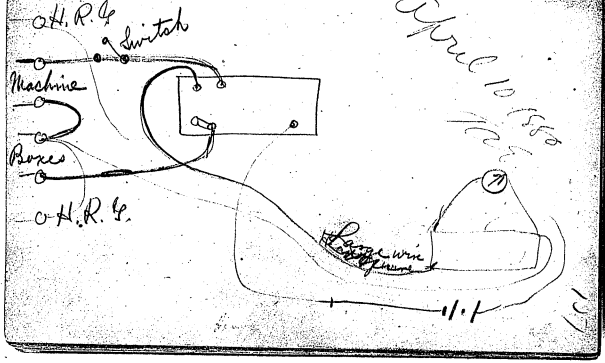

March 20
1880
Tab
Rubber


H.P.G.
Switch
Machine
Resistance boxes in series
H.P.G.
March 25
1880
Heavy wire

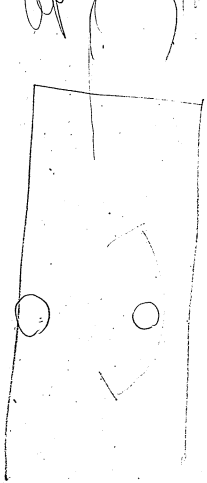


Circuit D 1860
T.C.E

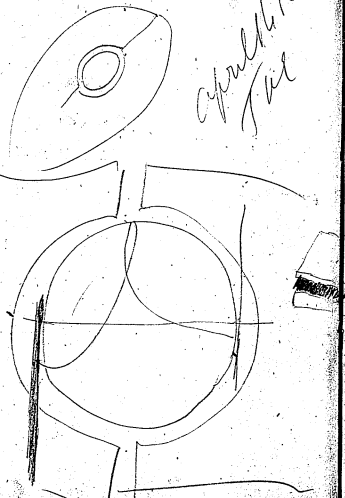



H. R. 4
Switch
Machine
Boxes
H. R. 4.
Large wire
1/1

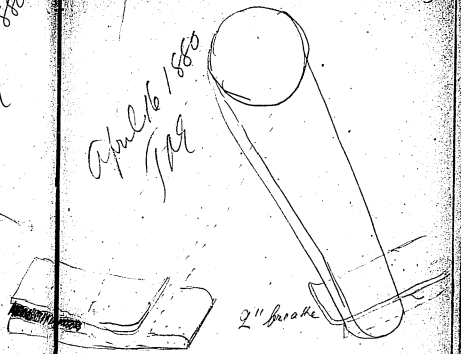
April 13- 1880

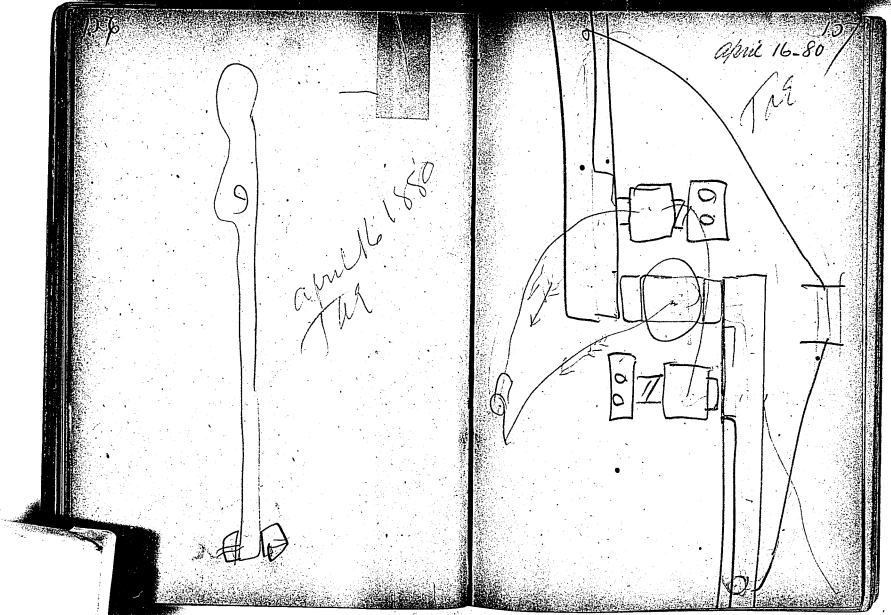


April 6 1880
Jig



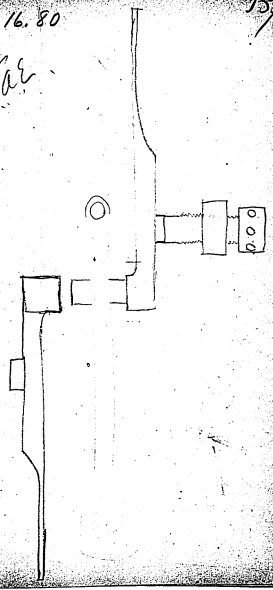
April 6 1880
Jig



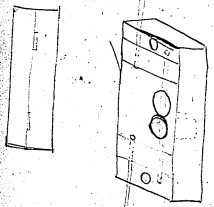

avril 16-80
avril 16 1880

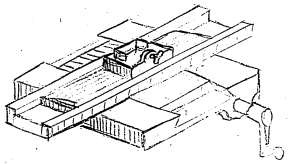
April 16. 80

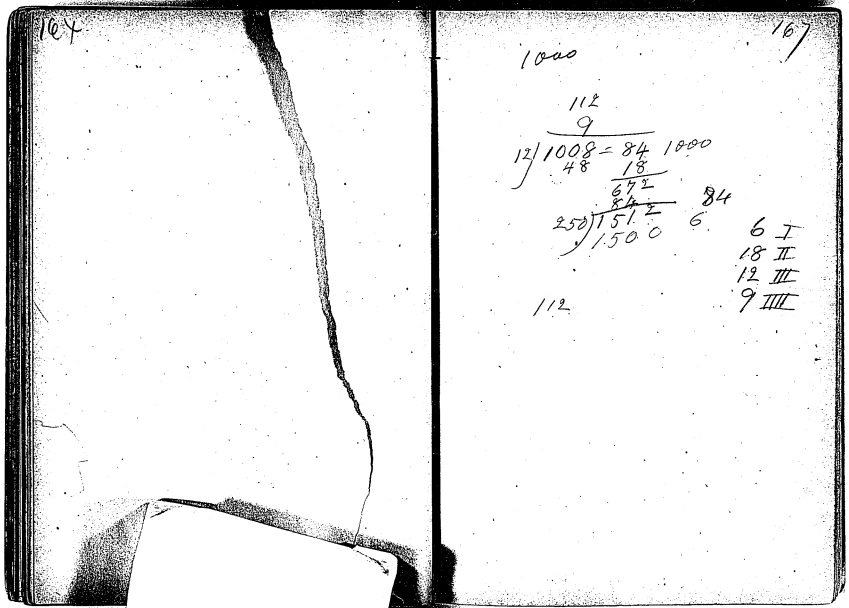
TAE

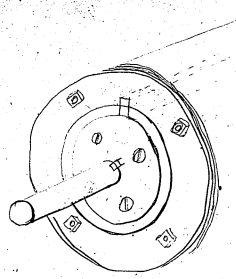


April 16 1880



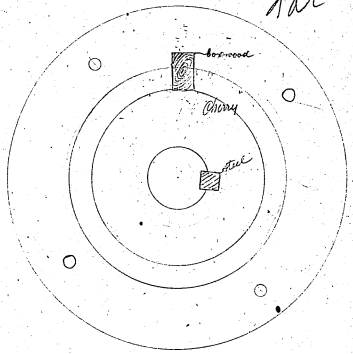


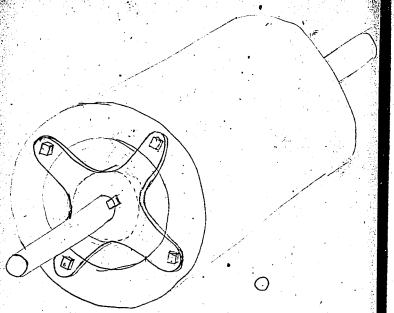

166
167
1000
112
9
12 1008 = 84 1000
48
18
72
84
84
250 1510 6
1500
6 I
18 II
12 III
9 IIII
112

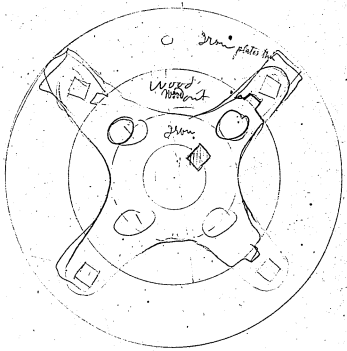


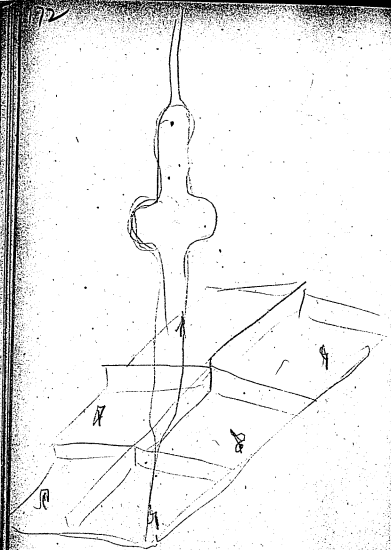
March 12 1880

March 12th 1880



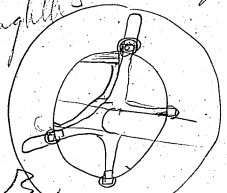



Iron plate
Wood
Iron



40 ft
4 feet

Hemispherical same as in glass house



Repair Glass Blowers

1 man to blow in mould,
4 heaters —
2 pullers - large
2 pullers, small —
4 = Sealers to inside small
4 Sealers for large, ready for vac
2 to Blow in mould —
2 pinchers after vac

Bench
· Loop cutting Machine, + place for man +
· Shelves for wood, unfinished + finished

1 Bench for furnaces

Bench Saw for working wood —

Bench Clamping machine —

~~Gas~~
Bench Rack for rolling clamps over floor

2 men
Bench for men pulling on clamps' top straps

2 men = Pulling on Carbon top Straps

1 - Inspecting bench large —

Rheostat etc Photometer

Bench - Man for putting plat wire
· to Copper ~~Wire~~ - quick running bench
of gas

Small.	Large
300	2100
800	800
500	800
1600	1500
400	500
2000	2500
	5100
	2000
	7100

Bench Screw Mac alongside, clamp machine —

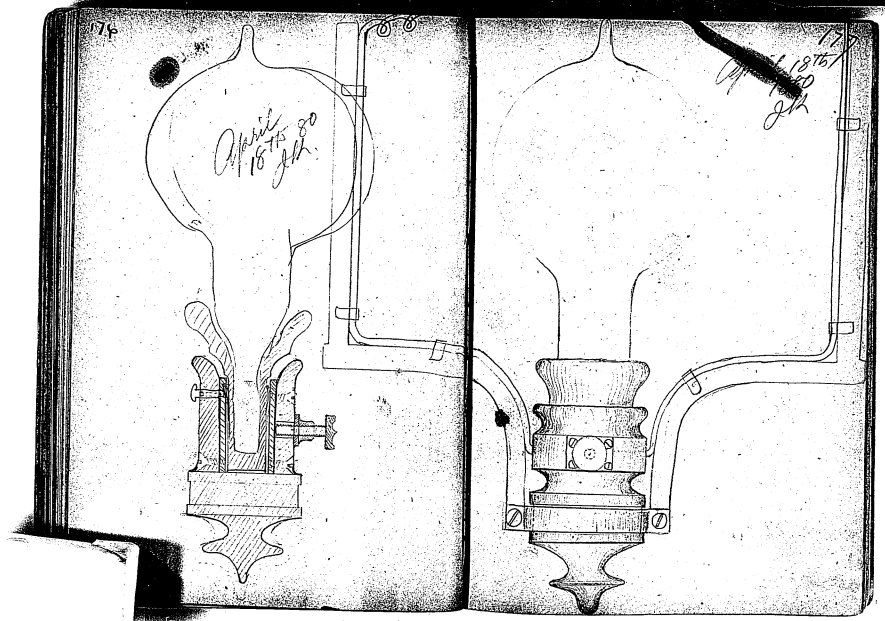
Repair man for pinions —

Carbon House —

Gas house + Generator

Blower

Mercury Clamp. House


April 1875 80 JH
April 1875 80 JH

May 30 74 1880

~~Track + Mules 2281 00~~ and Tax 1 Station

Track 10 Mile 22810 00

Station equipment & 4300 00
2 Side Track

2 Trains
2 Engines 12 Cars 2470 00

29,550 00

Operating Expenses

2 Ton of Coal per day — $14
1 Man with Horses — 5 00
Oil & Repair — 2 50

$21 50

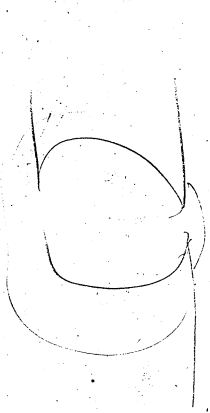
Average 30 Trains a day
of 24 Tons each = 720 Tons.
0.213 cents per Ton per Mile.

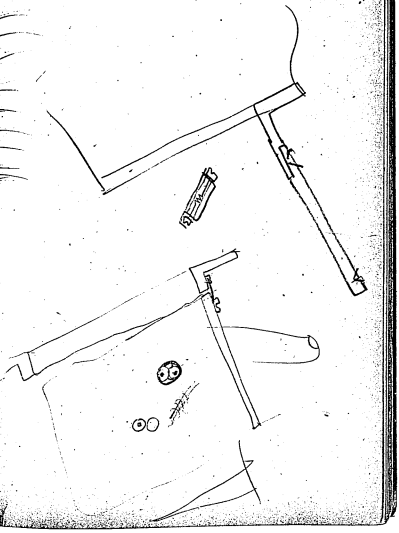
Metropolitan El. R.R. of New York 1878

4 Cars in Train weighing 70 tons. on gauge 4'-8½"

curve 90 ft. radius (63°-40')

	Rigid Wheels	Loose Wheels
Resistance on curve per Ton	1700	1308
" on Straight line	600	450
Increased resistance per Ton	27.50	21.15
Resistance per Ton per degree	0.4349	0.3337





120 Volts

21

60
60

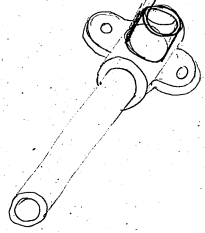
.14
.14

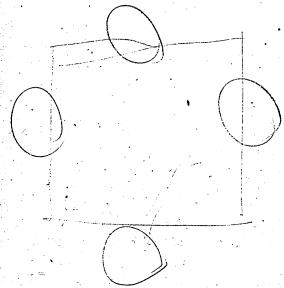
1/3 Ohm Total

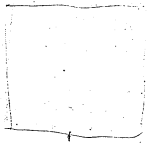
1/3 Ohm

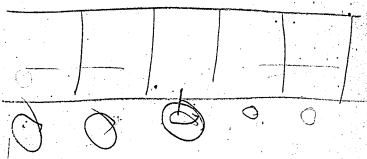
50
50
2500

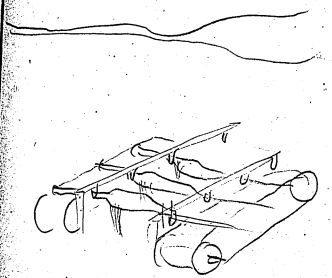
440000
110000
3
330000

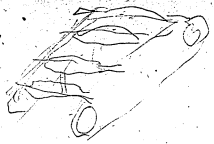


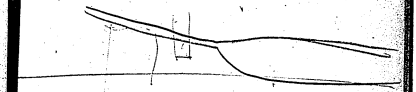


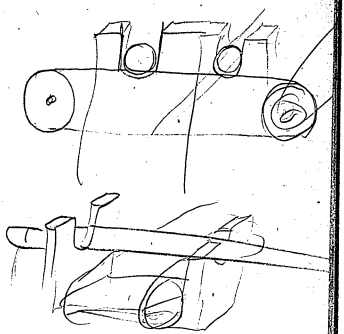


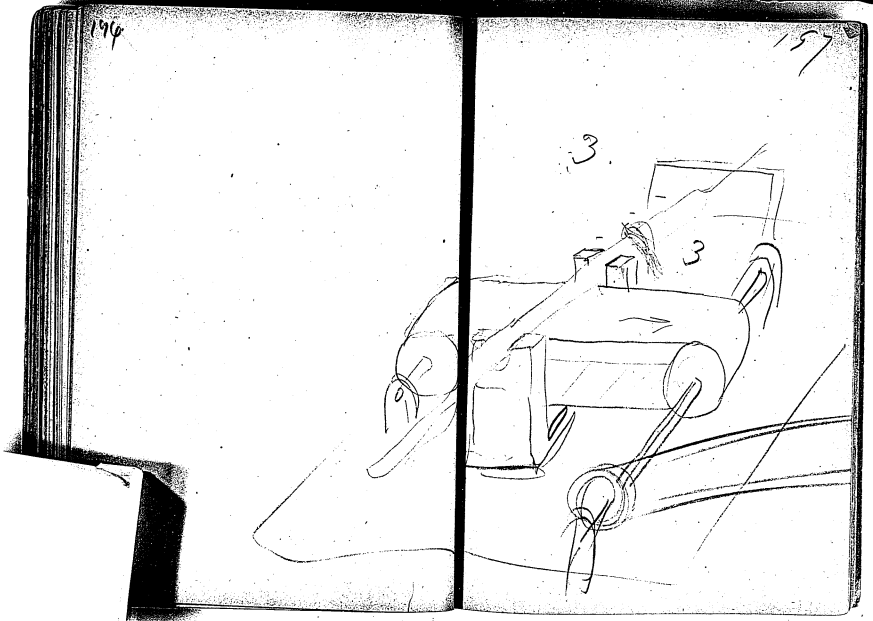











3.
3

150 Tons in 10 hours - about
580 lbs. per min raised 22 ft. high. -
about ½ H.P. -
Bucket. 9 × 23/4 × 37 to hold 10 ft.
allow 60 buckets to empty per min.

Grain bucket 12" c. to c. 18" long 5 5/16" deep 6½" wide
2-6" diam. 22" face crown at bottom
4 ply 20" wide rubber belt. (6 bolts to each bucket)
3 1/4" diam. 22" face crown at top.
Belt speed 450 ft. per min.

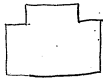
4-8" c. to c. 44 buckets 30 revol. per min

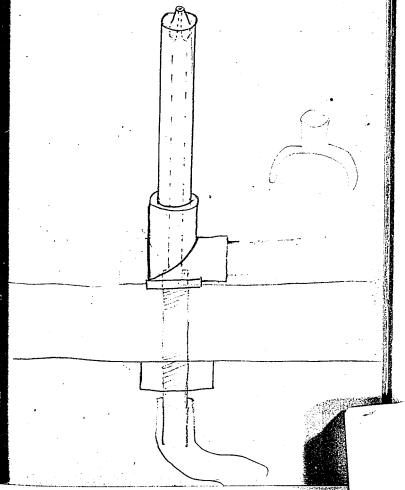
Frame of Magnetic Separator. 201

4 - 6" × 10" × 9'-6"
1 - 6" × 10" × 6'
5 - 3" × 3" × 22'-9" ✗
5 - 3" × 3" × 21' - ✗
2 - 3" × 3" × 14' - ✓
6 - 3" × 3" × 8' - ✓
12 - 3" × 3" × 4' -
2 - 3" × 3" × 5' -
2 - 3" × 3" × 6' -
2 - 3" × 3" × 7' - ✓
2 - 3" × 6" × 7'-6" ✓
3 - 3" × 6" × 4' -
2 - 8" × 8" × 12' -
1 - 8" × 8" × 8'-6" -
3 - 8" × 4" × 8'-6"
2 - 8" × 4" × 12'
3 - 8" × 4" × 2'
13 - 2" × 4" × 5'-6"

Lumber 200
Gas house for Lamp factory

8 3 × 4 7'8" long spruce

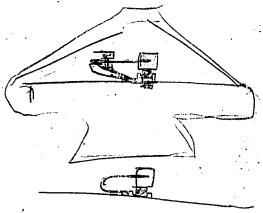


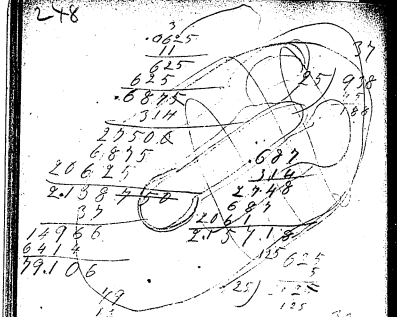


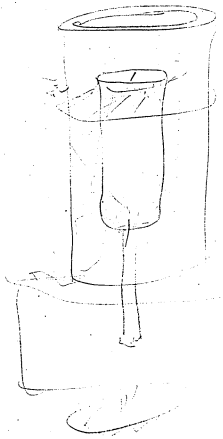
244

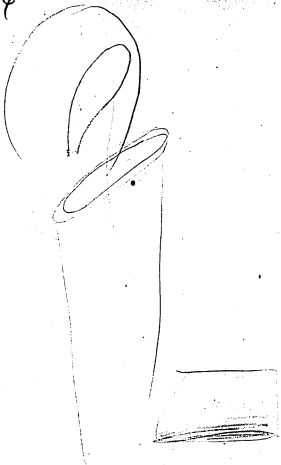
1000

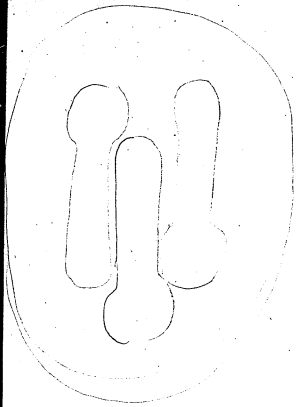
Telephone July 13th 1892 W
J. Kruesi

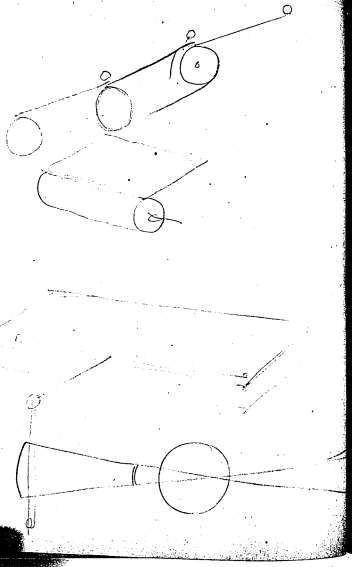


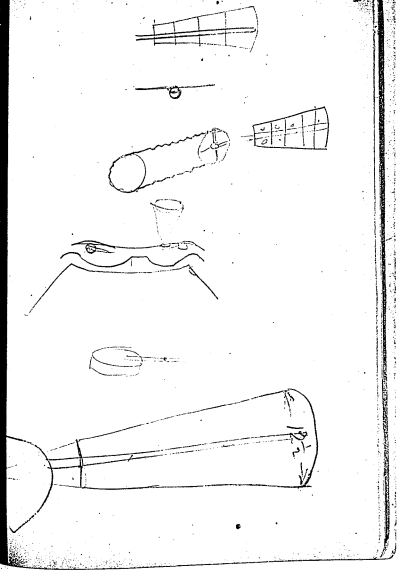


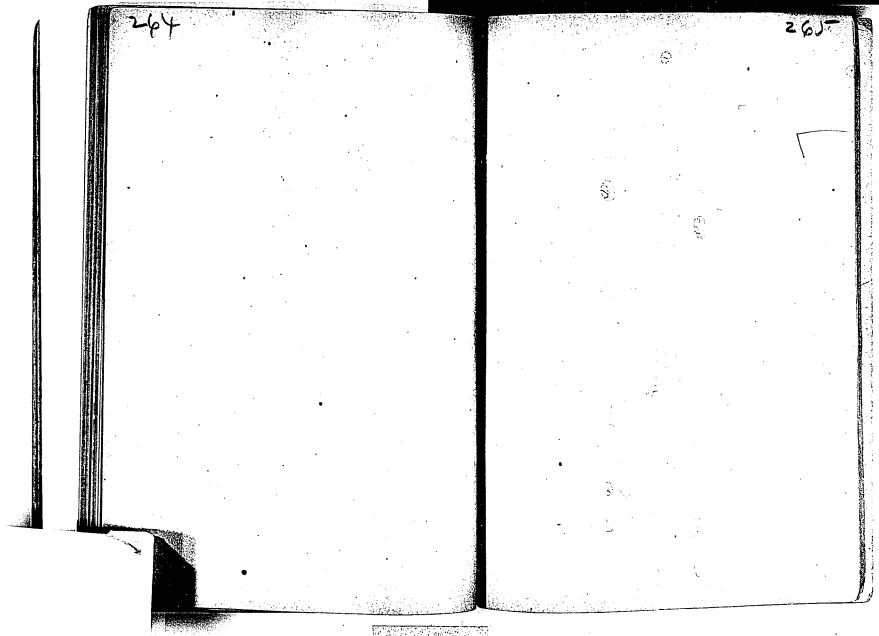


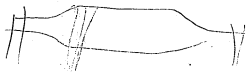


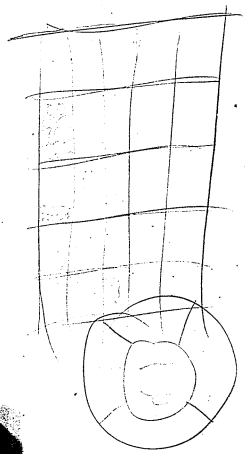


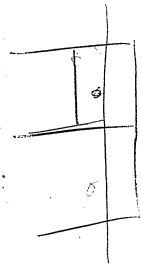


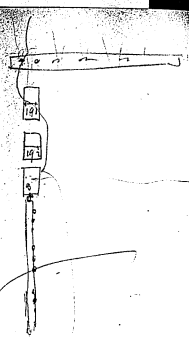


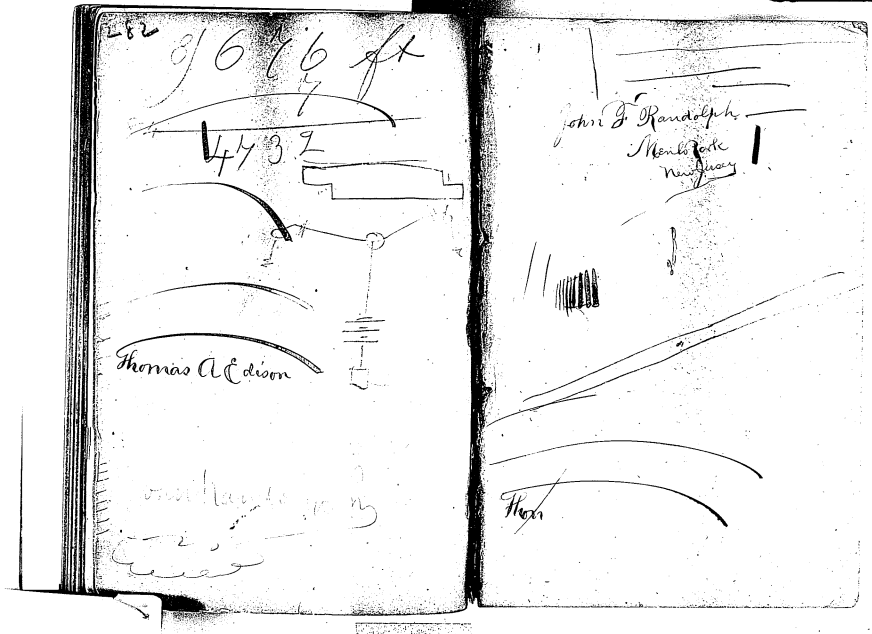

264
265







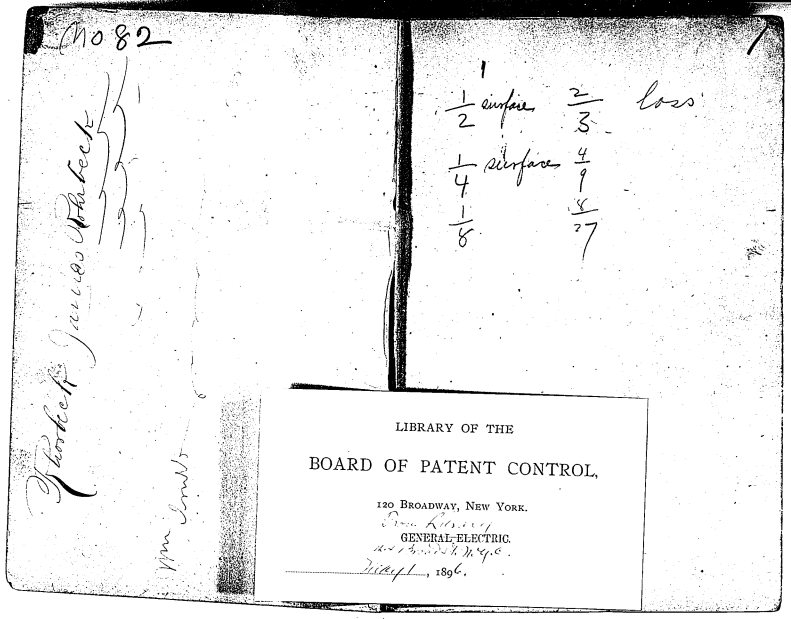


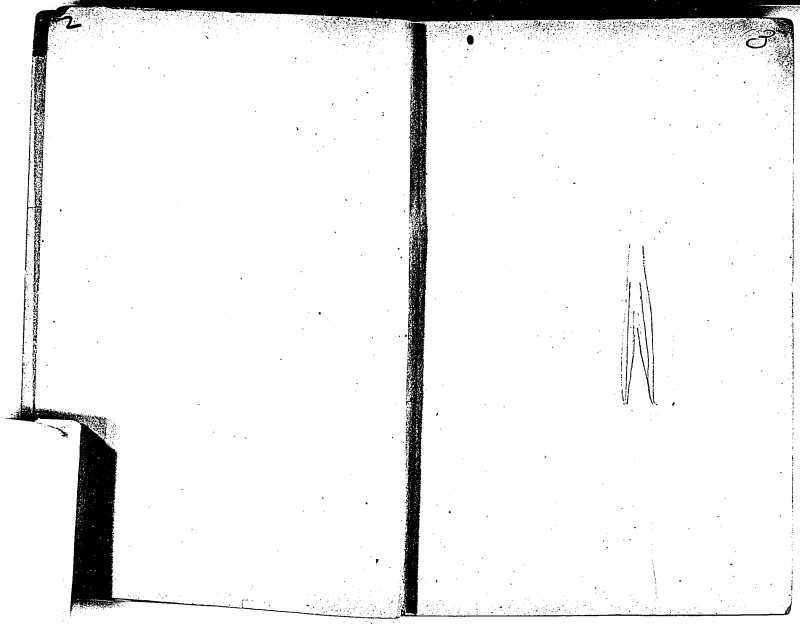

Thomas A. Edison
John F. Randolph
Menlo Park
New Jersey

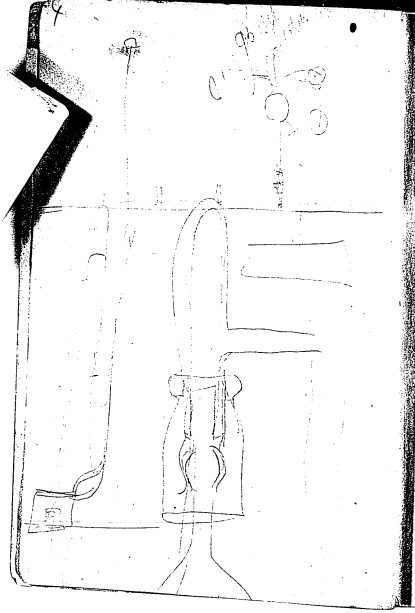
Menlo Park Notebook #82 [N-80-03-15]

This notebook covers the period March-July 1880. Most of the entries are by Francis Upton. There are also occasional entries by Charles Batchelor and probably by Francis Jehl and Charles P. Mott. Most of the book consists of notes, calculations, and drawings relating to generators and motors, along with tests of these machines conducted with dynamometers, electrometers, and calorimeters. There are also photometer tests of lamps, notes on fuses, and a list of lamps for the steamship Columbia. The label on the front cover is marked "Upton." The book contains 282 numbered pages.

Blank pages not filmed: 144-145, 198-199, 226-281.


No 82
1
1/2 surface 2/3 loss
1/4 surfaces 4/9
1/8 4/27
LIBRARY OF THE
BOARD OF PATENT CONTROL,
120 BROADWAY, NEW YORK.
GENERAL ELECTRIC.
1896.





1 ft of ~~iron~~ iron weighing 1 grain has a resistance of 1.0977 Ohms at 0° F
1.16334 " at 60° F

9 grains 9 lbs to yard

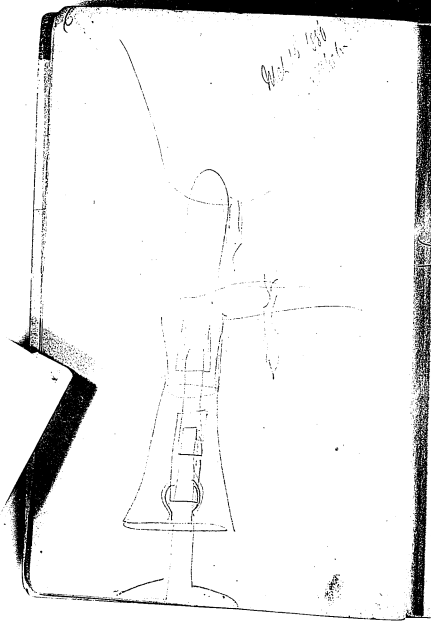
1000 feet of.

3 lbs 4 feet

21.000 grains

21000) 1.163709 (.000055
105
113
105
74

21000) 1.16340 (.000553
105
113
105
74



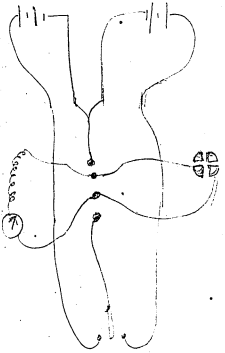
.0005553 Ohms per foot
1000
.0553 Ohms per 1000 ft.

5 1/2
100 Ohms

16

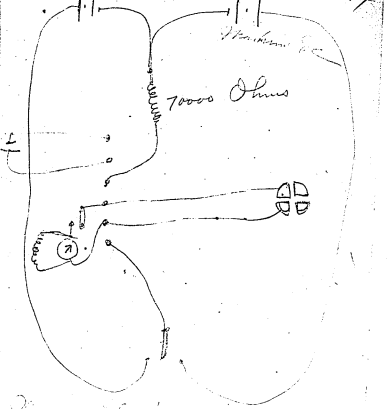
5.5.3
16 | 49.77
16
45
17
3.

Electrometer



This is the great ...
reversing it would ...
short Circuit ...
used

Electrometro



Plan électrométrique
Galvanomètre

12

925.
971
1896
950

925.
970.
955

985
990
985

985

Mean R.P. 971 & 1896 H.P.

Edison
Averag Wt. 985 lbs

12

Test of Prony
and Edison April 2, 1880.

(2, P.M.) Prony.

Prony shaft making 1113 R. in 2 min.
Edison. 985, 950. (2, 10. P.M.)
1,935. Mean 990.
(2.13. P.M.) Prony shaft making 1161. R. in 2 min.
(2.15) (2.17½) (2.19½)
Edison 935. 1,925. 925. 18½.
985
36, lbs, boiler pressure 2, 15. P.M.
Bad vibration of scale beam, Edison.
33. lbs. boiler pressure 2.17. P.M.
Prony shaft making 1130. R. 2 min.
29. lbs. boiler pressure 2.20. P.M.
(2.21½)
Edison 1025. 945 Mean 985.
27. lbs. boiler pressure 2.21. P.M.
2.23. "
25 lbs. " "
Stopped engine at 2.28.
Rest on Prony.

— over —

14

955 960 870 928
875 865 951 950
1830 1825 1821 1878
915 913 910 914
907
914
914
910
913
905
67
911 lbs

889 886
857 250
1526 1816
913 908

785
611
174 lbs gain
37

6.25
5.25
5.25
5.5
6
5.75
6.25
45.50
57

557

Parry & Edison Test. continued. 15

started engine 2.30 P.M. with
22 lbs. boiler pressure

Edison 955. 875 960. 865.
(2.35) (2.34) (2.40) (2.41)

(2.35) Parry. 12 ft. 5¼ lbs. admission to seal
(2.34) " 12. " 5. " " " "
(2.31) " 12. " 5¼ " " " "
(2.43) " 12. " 5¼ " " " "

2.42 Parry shaft making 565. R.P.M. MEAN
2.45 " " " 550. R.P.M. 557.5

2.43 Edison. 870. 951. 865. 950.
(2.45) (2.45) (2.42)

2.43 Parry. 12 ft 5 3/4 lbs.
2.45 " 12. ft 6 "
2.46 " 12 ft 6 "
2.47½ " 12 ft 5½ " 2.51 (2.52)
2.47½ Edison 865. 955. 866. 950.
(2.52)
2.47 Parry shaft making 554. R.P.M.
2.49 Parry 12 ft 5 3/4 lbs
2.50 " 12 ft 6¼ "
Parry shaft making 557. R.P.M. 355. P.M.

Prony & Edison test concluded

257. Main shaft making, 360 R, 1, minutes
3.00 " " " 183. R.P.M.
3.05 " " " 181. R.P.M.
3.05 " " " 183. R.P.M.
average 182

Data page 250 Book 41

Corrected size pulley 10.92

In timing the shaft the timer may have slipped as there was a very bad centre.

Wt scale 5 lbs 6½ oz 5.4 lbs
may be wrong as it was weighed in picture and weight remembered by Johnny

1092
181
1092
5730
1973
1976.52 spelled out

1976
37
73839
5931
73149 spelled out

5917
34
111

596 rem 16) 6.6
34
17

1115
596
519
480
39
16
23
16
7

Edison 73 149
Proxy 73 992

29

565
165
2825
3390
56 5
93225
3
16435 ft. lbs.

555
1
3336
556
88896
3
266688

1475
565
88560
7375
83
56
41306
24780
29910

Edison Povey Dyna- 21
mometer tests 2 Apl. 2.d 80.

TIME	
3.46.	Povey 16½ ft. 2 lbs.
"	" shaft making 565 Rp.m.
3.48	" 16½ " 3 "
3.51.	" shaft making 556. R.P.M.
"	" 16, ½ 2 lbs,
"	Edison 943. 943½. 943½.
3.53.	Povey shaft, making 560.
"	Povey 17 ft 3 lbs.
"	Edison 943½. 945. 946.
3.55.	Povey shaft making 552. R.P.M.
"	Povey 17 ft 3 lbs.
"	Edison 946. 945. 945.
3.57.	Povey shaft making 560. R.P.M.
"	Povey 3 ft 3½ lbs.
"	Edison. 945. 946.
4.	

Over

5·9
7.25
5

3·4
4.25
7.65
12
1935
765
11586
55 12
2316
5790
570 0
33921.6
28 16 92
35829 - Pitney

1992
7.3
52
3984
5976
29 | 62714
31372
2 | 65720
34.260

1992.
3
5976.

Edison & Poony Tests
Continued.

4.02.	Poony 12 ft. 7½ lbs	
"	Poony shaft making 510. R.P.M.	
"	Edison 892. 892. 892.	
4.04.	Poony 12. ft. 6. lbs	
"	Poony shaft making 542 R.P.M.	
"	Edison 892. 892. 893.	
4.06.	Poony 12. ft. 5½ lbs.	
"	Poony shaft making 560 R.P.M.	
"	Edison 890. 889.	
4.08.	Poony - ft. 44 - (900)	
"	Poony shaft making 552 R.P.M.	
"	Edison 913, 911. 913.	
4.11.	Poony shaft making 552 R.P.M.	
4.12.	" " " 783 "	

26688
28580
28210
28910
112368
28092

745
6925
525
1

1092
1825
596 6

514
6.5
11.9
548

1993

Average of Prony before 25
load 28092 ft. lbs.
Average Edison 945 lbs
One test
Edison 52.316 ft lbs
Prony 50.262
2nd Edison 56,055
Prony 63.643
3rd Edison Extremes 21.372
34.360
Prony 35.829

560
12
1120
560
6720

9.25
5.4
13.65
772
2085
7565
5172
7737
2900
2565

Electrometer

4 cells [illegible] for
main [illegible] 5mi

36 R 47 R
36 R 46 R
[illegible] of cm in wire

4 cells connected [illegible]
working [illegible]

46 R
47 R
46 R
46 R
46.82

0 adjusted

Electrometer 27

Amalgamated Zn
Pure Zn + Cu solutions
Tiphum

Right	Right
47.5	47.5
47	47

Pure amalgamated Zn
pure solutions

46.5
46

30

Standard cells with 31
10 grams sup

46 K 46.5 L
46 L 46

Unadjudicated comments

47 L 46.5 K
46 K

32

33

Opposed 4 cells

Standard 80% less powerful than amalgamated combined

Standard [illegible] than

[illegible]

Standard 30% less than amalgamated zinc

Standard 20 weaker than

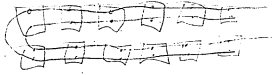
One cell [illegible] than the rest of the series

The standard in good condition a little [illegible] out

Test machine

Resistance of coil

1.74 Ohms



Plan test

1st Power required to drive machine magnet off circuit Power

2 end Power required to drive the machine magnets closed circuit

About 2½ per H. P. in current

1 = per H. P.

1 per H. P.

63 per H. P.

At the same time notice the Q. M. ⊕ with current open

3rd Power required to drive machine circuit closed.

Magnets 5 per H.P.
1 " per H.P.
6 " per H.P.

Make tests with 6 Ohms in color and 1.7Ω in color depositing cell in circuit.

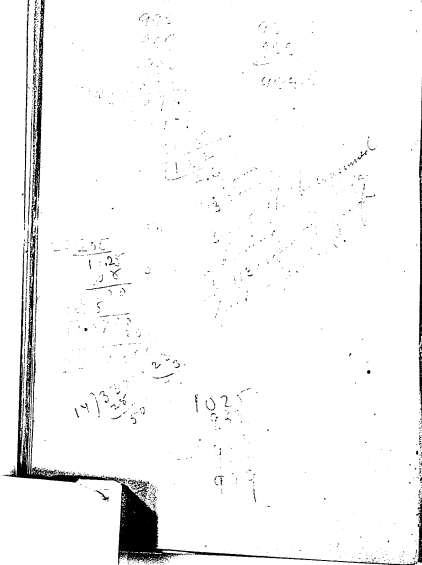
Electro dynamometer.

1/4 Ohm

Depositing cell and ammeter in same circuit

Make galva ~~scale~~ so as to be about three marks per Volts and measure Total Volts then so as to be about ten per Volt and measure Volts across E.D. 1/2 Ohm and depositing cell.

42



43

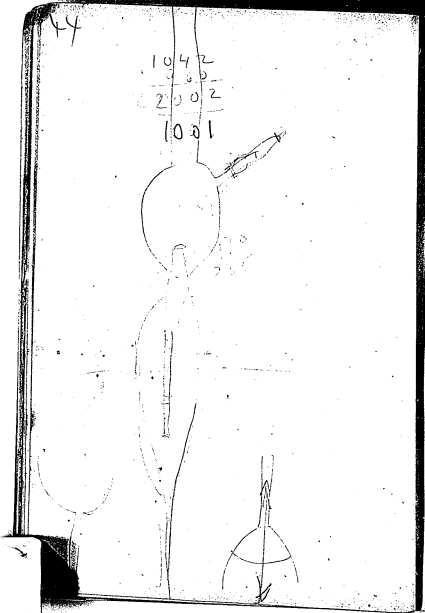
Plate I
Nt of Cr ~~5·82·75 Gr~~
5·82·9

Plate II 621·18 G.....

April 6, 1880.

The Resistance (12 ohms in hundredth) was 26 ohms
(20 ohms = 206 × 2·05 ~~Mag = 105~~
on the magnets 148.

On Edison's Dynamo 995
Extreme 1025
1025 + 963 = Mean 999
another extreme ~~942~~ 942 (The magnet was on the) Manuel one
extreme 1040



Mean 996.5 another
Extremes 960 = mean of both
Extremes 1001.

Magnet on
another extreme 945
Mean 951
another extreme 103.1
Mean of both extremes 986
another extreme 945

~~Mean 418~~ 5. P.M.
Brushes off magnet on.
Extreme 950
Extreme 942 6.4 Mean
Mean 92.5 6.0
Extremes 1023

10.

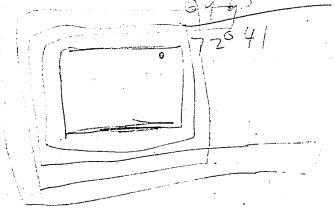
Temp air 69.35 F

Temp H_2O 66.25

3 8

94 3

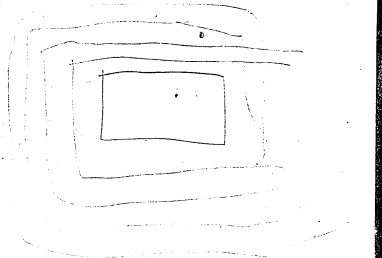
72 41



48

59

216
59
1944
1080
12744 Volts



48

5-35

49

20 cells = 50

Machine 295. Edison

975 Wagner on

~~1270~~

5-40 commenced

Machine current

255

Around Cabin 183

Running 847 Stopped 5-46.

845 Temp 43.5 72.5°

977 Speed shaft

183

185

50

28) 176

176) 28 (2 2 2 2 ...

1 5 2

1 8 0

1 6 8

1 2

204 000

169 000 x

2 5 5

845 000

5 9 5

1 5

1 5 3) 3 6 6

6 4 9

4000

51

Wt Velvet and stirrer 29 lbs

200	73.9
29	66.25
171	7.65
775	775
171	3825
775	5535
5425	5535
775	59287.5
6) 132525	171
22088	5928
	$1496
	5925
	6) 10136 x 8
	1689 48 Lt. lbs.
	220 88
	14 6860) 72.97

Calcu

Dynamometer

52° 10'

52

621.15
.555.1
4355

615.41
5772

53

720.1 .555.1

720.2 615.41

.555.1
.554.2
.000.1

621.15
.615.41
5772

5.770

10 9.50

6 5.4.5

5.45 Inches

3.1.0

0.45

1.2.55

10970

6 57455

19.5 1.914.0 46 Inches

1 756

1340

1290

550

153

50 X 1.08

2.7)183(67.7 in.

27

213

189

24

67.7

44.3 1.6464

Imp 1.7 = 0.7592

67.7

38.9 inches

5-6

.00373 Ohms coil

5-7

Resistance of machine

.14 Ohm

6 wires in multiple are

75 coils in machine .28 Ohm

each coil $\frac{.28}{75}$

$75\overline{).28000}$ = .373

225

500

525

250

.00373 Ohms in each coil

Since the wires are in multiple with Two coils in series the resistance of [illegible] coils

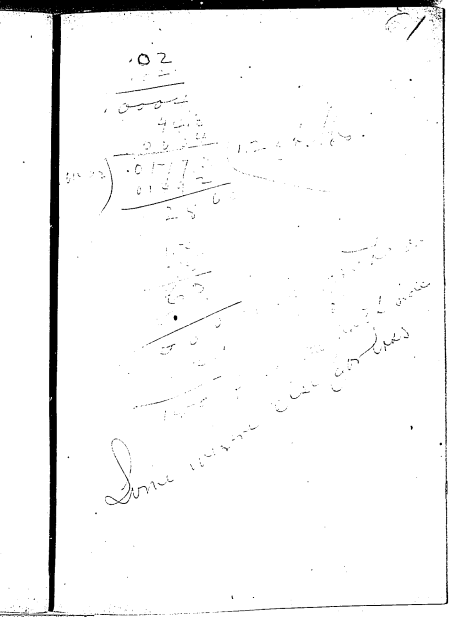
.0149 Ohm

In each coil there is an average $\frac{13}{75}$ Volt.

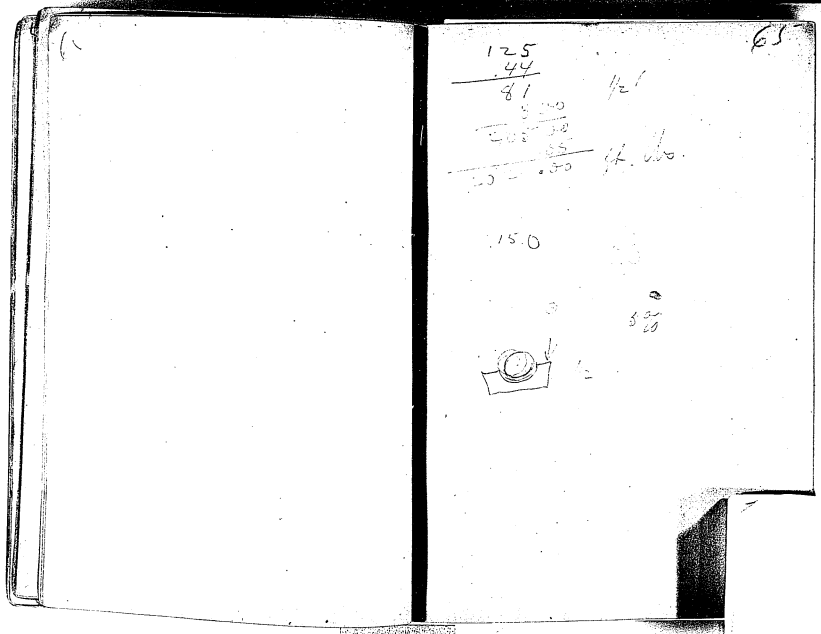
58

57

75) 130 (1.73 Yards
75
55 0
52 5
2 50



Friction on pulley



66

1039
996
2)2035
1017

45 min
25 min extra time
70
260
329)2640(8
2303
337

329)2640(80%
263
80

Extra time 15% Pay
264
359)2640(72%
2513
1270

33
8
264
15-0%
1320
2640
2760

April 6 1887

Machine off mean 1017 time 9.10
Extreme 1039
another extreme 996 = mean = 1017
Main shaft 18½ one minute
1017
999
18 one ½ the time
Machine

Engine at rest
1037 ½ at rest

1037
996
41 for one ½ time
Countershaft machine and
magneto on

Shaft 2¼ inches

15 inch pulley

3/8 inch

10 inches

1 1/2 machine

2¼ inches

$\frac{3.25}{3}$ 7.5.65

1.2

Shaft .6.72 feet

1.5 4.7 7

471) 2000 (42

1884

1160

942

150
.05
7.50 lbs friction

1100

12 | 1.5
1125
31
506
125
375
.3925
1100
3925
39225
4317.500
3448 ft. lbs
17000.

1.25 lbs
150 lbs Wt armature
Min R

12 | 1.5
1.25 feet
1125
1130
3750
125
125
141.2500 feet per minute
18.25
7666
125
.05
6.25

3
2649 ft lbs

99-5 machine on running magnets. ~~and~~ brushes off

95-5 machine running hard

Calorimeter

The floor is much colder than the rest of the room

The calorimeter may be slightly moist should be perfectly dry

For example

Temp floor	59°F
Top calor	64°F
6 ft Higer in room	66°F
7 feet	67°8F
Water in calor	89.9F

171
735
835
1197
1197
122305
.029
1190745
26961 0
3583 6565

1°25

16) 1.25 (.078
112
130

0°.0787 per minute

831
81.3
.07) 1.80 (.029
124
560
558
2

0°.0297 per minute between
82°.1 and 81°.3 .029
38.86 ft lbs per minute
1½ ?

Time

Time	
11-2 30	89°9 Water in Calor floor wet Calor wet
11-6	89°.5 F Wood Calor
11-15	Bottom air 59°.5 F Top Calor 61°47 air room 6 feet 66°7
11 22	88°.25 F Stopped stirring
11 46	86°.4 F
1-15	83°1 F
2-17	81°3 F
4-23	77°.2 F
8-20	71° F

78

18)300 (.166 Ohm
18
120
108
120

.166

1900

1000 : 900 = .166
9
1.394

1.4 Ohms

79

Resistance outside box
galvanometer $\frac{70}{5} = 14$ Ohms

$\frac{9000}{5} = 18$

resistance outside 1.67 Ohms
galvanometer

Inside 1.8 Ohms
Strong current

Turning machine with 0 load loses

Mr. K turned

360
3
1080 revolutions

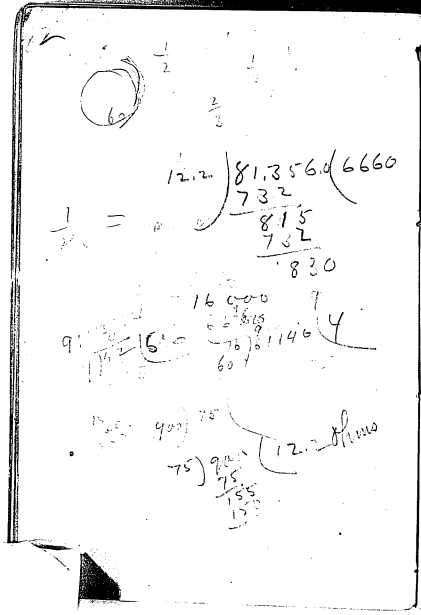
per minute with the brake off and was current on magnets

4 cells connected in series
3 cells of Fuller magnet
14 volts

.8
2.1
1.5
4.4

4.4 | 8682 | 1970 | 660 of the one magnet
42
42
37 3
3 2 3
36 4

660 | 33 0 0 | 50
3300



1/50 H.P. on magnet

Van Cleve with 27 ohms external turned 53 Volts

4444 ft. lbs.

Van Cleve and Dr. Knight turned 8300 ft. lbs.

Edison	140	15 Ohms
Travers	135	
Dr. Kahn	130	2nd time 125
Clarke	115-120	
Linn	120	
Holzer	125	
Van Cleve	135-140	
Upton	115-130	

54

55

Matt 120
Hammer 110-112
Billy B 110-112
Force 135
Francis 135-140
Hammer 125

O 2 to 2

Lawson 120-122

140 [illegible]

8th

.0648 .0648 .0648

2240 2240 .3888

1296 648

16200 9720

No 2 615.39 + 0 grains 615.39

No 1 588 grm 1.5 grains 588.972

after 26 minutes

11 639 20 grains 640.296

1 564 2.85 564.16

640.296 588.972

615.389 564.16

24.907 24.812

24.812

49.719

24.859 2

24.859 4.3955

sample 26 8.5851

sample 19.5 8.7100

49 Webers 1.6906

1.6906

1.6464

0.2705

1.7

154 [illegible]

8.25481

April 8. 97

9 in one ounce

1000 M.C.

8600 Ohms other

$\frac{300}{18} = 16.6$ Ohms

Boxes [illegible]

.25

.085

.1825

816

1092

1256

1.56 [illegible]

Measure [illegible]

1.66

.0675

1.53

$E = \frac{q}{R} CR$ $W = I^2 R$ $W = \frac{E^2}{R}$

$R = \frac{l}{A} \frac{c}{c}$

Cu. I.E.M.F.

$R = \frac{l}{c}$

81 .14

192.000 47
.0261
Total 204.500 5.3108

April 8

Connecting wire .07 Ohm

Time	
2-40	6 boxes .5 Ohm
	Temp 67°2 F
	6 in box .49 Ohm
	49 Ohm
	Tower 1.52 Ohms
	1.52 Ohms
	.5 Ohm
	74° F

207 000 ft. lbs. [illegible]
192 000 [illegible]
247 000 given as [illegible]

775	2.8893	85.5
171	2.2330	55.7
29.8	1.4742	29.8
Comp 25	8.6021	
	5.1986	15.8000
	.1184	Calor-
	.0261	220,000
	5.3431	

243	21.3856	5.1986
145	21.2672	.1184
1.313	.1184	5.3170
17	.2304	
	.3488	
2.23		
.14	.3749	
2.37	.3488	
	.0261	

April 8

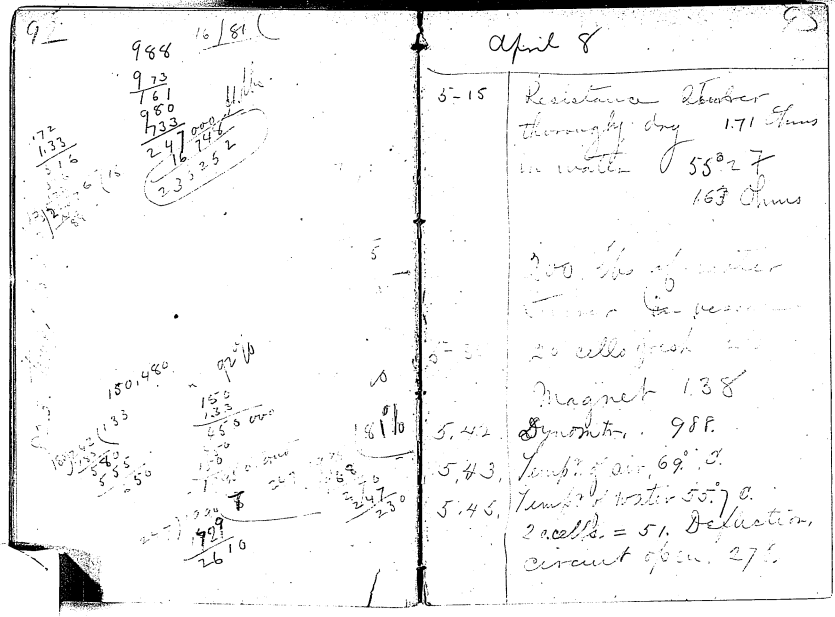
3-10

6 boxes .52 Diam
[illegible] .51
.51
Plaud on shelf
71° F

Stirrer [illegible]
1.7 Ohm

~~[illegible]~~

2 in water 100 Ohms
[illegible]
[illegible]
with [illegible]
[illegible] 1%



April 8

5-15 Resistance 2 bucket thoroughly dry 1.71 Ohms in water 55°27 163 Ohms

Two No of cells in series in opposition 20 milligrams

Magnet 138

5.42 Sunshine. 98°.

5.43 Temp. of air, 69°.

5.45 Temp. of water 55°.

2 cells = 51. Deduction, circuit open. 27.

94

92 152
173
93
51
153
1.581 Ohms

15
.93
64
1572
1.724 Ohms
in Calor

as 5.0276
.1987
5.2263
168 0000 ft lbs
130
87
Copper.

5.3420
.1987
5.1433
139000 ft lbs
Galvn

150.450 ft lbs cal
Calorimeter mean of 4 Galvn
168
139
307
153.000 ft lbs

April 8

P2.3.C. 75

5.50. Plugged generator.
5.53. 9300. Revs.
5.55. Temp of water 61.1°C.
Dynamometer. 747, 733. MEAN
" 739, 734. REV.
5.57. Electro-dynamometer 57°.
" Temp of water 65.2°-65.7°.
6.00. Dynamometer. 736. Rev.
26 cells = 50.
Deflection
6.05. Dynamometer 733.
6.07. Temp of water 74.5.
6.09. " " " 76.5.
6.11 " " " 80.2.
6.15 " " " 85.5.
6.16 Plug pulled out of generator.

96

E.M.F.

2.5.5
1.0 8
2.0 4 0
2.7 5
2.7 5 4 0

2.75) 185.00

~~185.0 1.76~~ 74-
244 2

$\left(\frac{185}{275}\right)^2 \frac{44.3}{1.7} =$ Volts 0.4393 1.7463

6 —
6 —

0.5.7 20

L. Illes

2.2671
9.5807
9.7695
1.6172 40.9 Webers

244 2.3874
comp 2.75 9.5607
1.9481 88.7 Volts

97

April 8.

973 Dynamometer
20 cells 210-209
83 around resistance boxes

Plate. 11
639 grms 20 grains

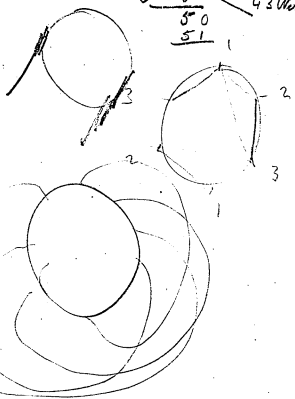
Plate 1
564 2.5 grains

20 cells 50 & 51
around cabin 185
Total machine 343-245

28 | 210
1.05
1.05
5.25
7.35
147.00

#13 | 8.3. (7.3 Volts
791
390

17 | 7.3 (43
68
50
51
43 Volts

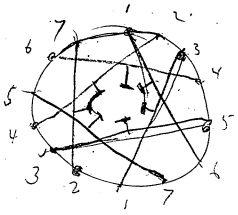


443
9
418.7
20
8374.0
2
16748
2

1/10

32

14
28



4 .00373 / 44,300 / 11,800

373

706

373

3270

44.3

44300

11,800 ft. lbs

2

23600 ft. lbs one coil with Volt 2.11.7 in short circuited

Tried to see if position of brushes made much difference could not detect the change in power with tachometer with magneto disc for 2 C.

Conductors for Parks

	Light	Lamps
(1) Trunk line	2150	28
(2)	1500	20
(3) End of 1200 feet along 300		4
(4) Distance out 420 feet along 1700 feet		19 lamps
(5) Distance out 700 feet along 300 feet		4 lamps
(6) 300 out along 2000 feet		23 lamps
(7) 1300 out along 300 feet		4 lamps

(8) 700 feet out
along 1300 feet — 15 lamps

(9) 1300 feet out
along 300 feet — 4 lamps

(10) 1500 feet out
along 300 feet — 4 lamps

(11) 700 feet out
along 2000 feet — 6 lamps

(12) 700 feet out
along 2500 feet — 30 lamps

(13) 1200 feet out 10
along 600 feet 8 lamps

(14) 2700 feet 26 lamps

115 2200 feet 28 lamps

Time	Remarks
P.m 1-30	Passed about 45 Webers. through 18 wires as three Ohms each in multiple arc. One bus measured. Rold 3.09 hot 3.20 3.) .11 (.036 3.6 % difference hot and cold Resistance of wires see page 91 .173 Ohms

.036
.018
.054
.00324
173
.18 Ohms

989
573
116 ans

82.3
63.2
30.5) 191 (.62
183
80

165
775
940
1176
1176
1.2.3.5.36
2510 00
7836
.8091 60 0
1.42
16182
32364
5091
1.1.4.8.9.2.2

250
176)250(1.42
176
740
704
360

Dynamometer 116 ans

168 2.2253 comp 176 4.9113
775 2.8893 7.5065
19.1 1.2810 rest 250 2.8779
comp. 30.5 8.5157 50 0.0286
49113 0.0225
81.900 0.1323 0.0277
50636 5.1770 total
116000

1020
959
1979
989 mean

P.M.

3.15. Temp. of water 63.2.
3.15. Temp. of air 72.°
3.05. Plug of generator
3.06. Electro dynamometer 1.9.° 2.8'
3.08. Dynamometer 915 Revs.
3.09 Electro " 11.° 41'
3.11 Dynamometer 845 Revs.
3.12 Temper of water 67.7

23.1 2.5-0
83.3

59 1.7708
1.72 0.23555
.5353

34.3 Webers

Apl 9. 1895.

3.14. Electro dynamometer 14.° 35'
3.21. " " 15.°
3.22. Edison " 910. lbs
Ft. 20 volts = 65
Feet 2nd 250 − 250 total
on cabor
Seconds 176 − 177 Machine
910 lbs.
3.24. Edison dynamometer
3.26. Temp of room 75.° F.
3.27. 93 " "
3.28. Electro dynamometer 15.°

The copper coil between the plates 100° F during 80°= made a large difference in the temp after reversing to right

over

2x 207

comp 1.035 8.9855
comp 1.08 9.7662
60 1.7787
.7302
comp.18 10.7447
1.4749

29.8 Webers from resistance boxes

.7302
comp .17 10.7696
1.4998

31.6 Webers

April 9, 1895.

No. 1. Resistance around resistance boxes 60
No. 2. around electro-dynamometer
No. 3. around coil 134
[illegible] 82.3
3.36 [illegible]
3.35.2

20 coils equals 207
60 on resistance
134 on [illegible] coil
Magnets 5 Watts

116

.1064 8
15.5

584 grms

.0648
15.5

618.745

640.296
618.745
21.551
19.84
1.711
.855
.584
618.745
1202.745

21.551
.855
20.696 Grammes

$\bar{2}.8116$
1.1903
.0019 = 1

$\bar{2}.8116$
1.0607
1.8723

584
564.16
19.84

640.296
564.16
1204.456
1202.745
1.711 Loss

117

No. 1 Plate 583 grms. 15.5 grains
No. 2 Plate 618 grms. 11.5 grains

Wt of H_2O 15 gl.
17 with cord
2
19 lbs

20,700		4.3159
comp	30.5	8.5157
comp	19.5	8.7100
34.8 Wchgs		7.5416
83.3		1.9206
		1.6464
		5.1086

128,000 ft. lbs.
136,000

Results

The strength of the current varied ~~considerably~~ ~~during~~ during this ~~re~~ owing to the heating of the coil and consequent ~~of~~ of copper resistance

116000 Lt. Mos. Deflection
125 000 Ft. Mos. Calor

This is due to the fact that the deflection test was made until after the current had decreased

130000 by Ballistic

Calling resistance Calor 1.72 Ohms
34.3 Webers

Calling resistance Lorenz 1.17 Ohms
31.6 Webers

From Ca. deflection
34.8 Webers

120

992 — 820
857.5 — 895
134.5 — 115
c — 857.5

134.5 = # lbs dynamometer

541 30 — 77
5 27 30 — 67.6
14 — 94 — 3 (267 / 89

171	2.2329
775	2.8893
9.4	0.9731
comp 14	8.8539
87.000	4.9493
233	2.3674
comp. 190	7.7213
109.000	5.0380 outside
for sec the 1.02	.0086
1.72 0.23555	5.0466 111.000
232 2.36576	0.0277
comp 192 2.72173	5.0743 118.000
.3242	5.1287
.14 1.1721	.9956 88%
6.63 1.8219	conversion

Experiment 2 — 121
Apl. 9, 1901.

200 lbs H_2O Summer

20 = 85
Temp 14

Test obs 261 – 267

5.22. Edison dyns. 1925. lbs.
" 960.
5.23. Plugged generator 1985
99
5.24 Electric dyno. 19°
5.26. Edison " 82°. lbs.

27-30 67.67 H_2O

5.31. Edison dyno. 295.
5.32 " " 820
5.32½ Electric " 19.°5

122

34.2 1.5343
+4.3 .6464
39 1.9094
5.1301

135.00

Resistances
Comp 10.35 8.9852
Comp 1.05 9.9666
65. 1.18129
comp .17 10.7696
1.5343.
34.2 Webers 7696
5.81 Volts .7647
1.5773
2.3420
1.6464
3.9884
1.9823
4.9707 93.600

41
23
18.5

Ex. 2. April 9 123

5.32.2 Temp. of water .. 71.°
5.35.30 18° 40' Elec Dyne
5.36.30 Temp. of water 73.' 2'.
Current on 233-234
77.6 Volts
189 - 190 around coil
5.39.30 Temp. of water. 75.°4.
5.41.30 Field Off
" " Temp. of water 77°
29 coils = 2.7
Diminished resistance 1.5°
Shunt 186 new shaft

Prop 116 · 0648 ÷ 2.8116
1.4 .11461
570.091 ÷ 29577

632.097 ÷ 2.8116
1202.188 .17761
1202.745 ÷ 2.9877
.557
.278

632.097
584 6.18.745
570.091 1 3352
13.91
.278
13.631
comp 18.5
comp 19.5
37.8 Wchrs
77.6

4.1344
8.7329
5.7106
1.5773
1.8899
1.6484
5.1036
.0277
5.1312

3 ÷ 33
77.6

Plate 1 576 grams 1.4 grams
Plate 2 632 grams 1.5 grams

63	1.7993
63	1.7993
4m.3	1.6464
comp 1.72	9.7645
	5.0034

1.7993
9.7645
1.5638
367 Wchrs

100000

Flower 1.77 1.7993
1.5812

35.6 Wchrs

Resistance stirrer 1.77 Ohms

1.77 1.2480
37.5 1.5775 Current Ck.
37.5 1.5775
94.31.6464
total .0887 outside
Machine 1.77
5.1665
total

Results

134.500 ft. lbs. dynamometer
118.000 " " Calm to 5
500 20

135.000 ft. lbs. calculated from current and E. M. F.

Calculating from E. M. F.
on stirrer 2 - 1.7
35.6 Watts

Calculating
32.5 Watts

Calculating from resistance
32 = Watts

289. 2.4609
171 7.7620
.2279
1.12 .6492
9.7720
66.2 .8212

The resistance of the small should be from quantity of H_2O 66.2 Ohms / 100

Small 127 7.8962
71 1.8513
1.12 0.0492

.627. .9977

from the galvanometer it seems to be .627 Ohms

289 : 171 :: 1.12
171
112
784
1915.2 7.66
1434
1812

.193
.66
.127
252
140

.032 8.4

~~Large~~ ~~small~~ stirrer
1.17 − .05 = 1.12 Ohms
at 68° ~~F~~

Stirrer for small calorimeter

23. 23 Ohms − .05 = .88
27 turns on small stirr

192 lbs of H_2O TY vessel
189.75 H_2O

192 27) 23.75 (.88 Ohms per turn
110 70
56
358

110 lbs
23.75
8675
56
2325
32.75

169.75
56.75
32.75
289.25

.0648 2.8116
2.5 0.3979
T.2095 .162

4.5 .6532
T.4648 .291

14 1.1461
T.9577 .907

565.162
626.907
1192069

599.291 No 2
592.291 No. 1
1191.582

592.291
565.162
27.129

626.907
599.291
27.616
.243
27373

1192.069
1191.582
.487
243

April 12 1888

Stirrer .65 Ohm

No 1 565 grms 2.5 Grams
No. 2 626 grms 14.9 grams
No. 2 599 4.5 grams
No. 1 592 4.5

30 | 27.373.
9124 2.9597
19.5 1.2900
46. 1.7
109 Volts 2.0365
1.6629
.3526
9859% .1934
5.5560

Outside plus inside 221.000

Chemically pure water

Through the body four cells = Def 350
3 cell .. 282
2 200
1 110

7000 ohm 1 cell = Def 90
2 160
3 230
4 285

4 cells C.P against 4 cells of Standard 35 L
Direct

4 cells C.P against 4 cells Standard 15 L Shunt on
3 cells C.P against 4 standard
300 R

134

135

4 cells C. P against
4 cells Standard 4-5 L

$\frac{4}{285}$ 0.6021
2.4529
.1493

1.4%
1.5% 10.15 .0065
.0065
.0130
1.08%

3% increase of work done
to polarization of battery
on playing end

9/18

171	2.2330	289	2.4609
775	2.8893	775	2.8893
.1437	1.6405	.45	1.6532
	4.7628		5.0034

$5^T 7.900$

101.000
57.90-0
1589.00

2.45	2.45	72.1	70.2
2.18	2.19	60°3	61.2
27	26	11.8	.90
	2.39		
	2.19		
	20		

11.8	1.0719	Large
Small 27	1.4314	
.0437	1.6405	.45

Optical M.

time	
	Eclipse Sign on sunset 10.30 Eve
	9.05 Eve
1.40	Start [illegible] 5 volts on the magnet

45 = 15 Volts on magnet
20 cells = 50 for rest
284 − 252 / 3 = 97 Volts

2.2 — Eclipse Sign 9.26 Eve
10 = 2 ; 2 at time
280 − 279

2.15 — Started 3
2.15.30 — 34° 24'

~~Eclipses~~

2.18 — 60°37 Small
2.14 — 61°2 7/10 Large

138

71
127
198

25.2
comp 198
158.900

2.4018
7.7043
5.2011
5.3867

.1056

203 000 Calor Total nutrients

Dynamometer

980 955
725 745
Edison 255 000 240 000 Nylon

25

139

-20 800 lbs Lyne
900 lbs. Lyne N
790
700 lbs Lyne

2-27 30° 3½'

2-29 65°27? Small
250 - 252 - 254 - 252
from machine

2-31 66°7

712
714
718
716
717

Air 68.5 +

71
127
198

1.12
.65
1.77 Ohms

198 2.2967
Comp 2.5 9.6021
1.079 0.10330

9.6351
2.4013
2.0365

~~Comp 1.77~~ 1.9318 25°
T 44.3 1.9318
Comp 1.77 1.6946 109 Volts
9.7520
5.2626
1.9894
3.2488

175 000 ft. lbs galva in calor
.1056
5.3544

226 000 ft lbs outside by galvanometer

1% subtract for conducting wires

224 000

2-36 71 on Small calor

2-37 68°.57 Small calor

2-39 70°.2 F Large calor

725
729 Edison
732

2-40 127 on large calor

2-45 Stopped

72°.1 Small calor

975
980 on
7 Large Calor measured but not noted.

1.21
65
1.86
1.88

2.39 Ohms
.14

.2742
.1056
.3798
0.1461
1.7663

584%
1.058
221.000

5.0245
5.3444
5.3689

233.000

224

5.3502
.0245
5.3747

237

203 · 5.3075
.0245
5.3320

3689
4065
7754

3689
3802
7491

3747
4065
7812

3747
3802
7549

3424
4065
7489

3424
3802
7226

Large calor
Stirrer 25 7.25 lbs

Vessel 26.5
33.7
Calling all iron 3.7 lbs of Fe

Result

Dynamometer

Outsides	Edison	255.000 ft. lbs
	Upton	240.000
	Galva Cu. cell	221.000
	Galva Resistance	224.000
	Calorimeter	203.000

920

Total Galva Cu cell	233.000
Galva Resistance	237.000
Calorimeter	215.000
Add 2% for vessel stirrer	220.000

	Edison	Upton
Galva Cu cell	91.7 %	97.4 %
" Resistance	93 %	98.7 %
Calorimeter	89.3 %	91.7 %

1914/15

Experiment 2. 147.

time	
	Magnets
	Armature
	Flow H_2O in small calor. 179.5
	" " large " 309.5
	Temp small calor
	" large "
	Started

148

$\frac{22}{2.4}$ lbs of H_2O to be added to small calor.

3.7 lbs of H_2O to be added to large calor.

311
3.7 1
314.7 in large calor.

180
22
158
2.4
160.4 lbs heat capacity small calor.

149

In large calor.

179 net 23 lbs small in vessel

122.5 gross
23
99.5
179
278.5 lbs
32.5
3.11 lbs in large

Temp 61.87

~~164 - 5~~ Small calor
180 lbs gross
at 62.07

675
760
1435
717 mean

946.5
1020
1966 5
983.25

6-4	65 Volts on magnet
	946.5 Extremes
9	1020
6-~~9~~	~~Started~~
	37° 45'
6 15	
	20 cells = 50
	Circuit open 296-295
	closed 261-260
6-12	Elec Degree 34° 30'
6-13	74-73.5 around small color
6 13	675 just touching [illegible]
6-16	760 717 mean

788.5
635
1423.5
711.7
711
14287
Means 714.35
983.25
2 2689
1344.125

314.7 2.4978
comp 160.4 7.7949 lbs in calores.
73.75 4.8672
143 2.1599
in place of 130 from resistance Galva

---

63 : 114 :: 73.7 1.8675
Resistance ohms 1.14 2.0569
comp 63 8.2001
.133 2.1256
in place of 130 from resistance.

---

comp 73.7 8.1325
2.1139
7.9983
2.0457
1.11 Ohms from deflection in
place 1.14 from resistance

6-17 130 - 30 large
placed the weights so that the arm just left recurrently the nib
touched it was held.
788.5
635 711.7 means

6-20 6-23 30 258 total

6-22 69°6 F Range calor.
Air 70°3 F
very probably the shoulder shifted

6-24 Speed shoulder 175
forearm 25 lbs Engine
23 in Brake

6-27 Elev 39° 47'

6-30 256 total

1.4

Sp 184 mm 268.9 mm Hills

20000	3.3010	
comp 184	7.7352	
176	2.2455	
191.3	3.2817	
134.45	2.1287	
257.000 Hills	5.4164	Styne

79.3	78.4		6 40
62.7	61.8		6 9
16.6	16.6	1.2201	31 minutes
	31	1.4914	
		1.7287	73.775

Large	314.7		annual calves total	130
small	160.4			20375
	475.1	2.6767		259
	775	2.8893		5.5660
		7.7287	16.2	1.2095
			comp 31	8.5084
197.000		5.2947		5.2841
comp 203.75		7.6911	192.000	7.6911
259		2.4133		2.4133
250.000		5.3991	244.000	5.3885
Page 142		.0248		.0248
Calves 265.000 Hills		5.4239	259.000	5.4137

15.5

(3.55 revs in 2 minutes
1775

Sheridan:
34° 22' Blen Styne

Lotus [illegible]

[illegible]

Jumping [illegible] 78.9
Large 78

Acid 4 for the 15 minutes
small calves 79.37
Large 78.47

Page 130

.0648

6.620.804

571.324

1192.128

620.804

592.291

28.513

965

478

28.756

599.291

571.324

28.765

28.729

comp 31

comp 19.5

4.46246

8.5086

8.7099

1.6809

417.9 Webers

Page 140 constant 259

111 Volts

9.6351

2.4133

2.0484

1.6809

1.6464

5.3751

.0248

5.4005

Antrade 237000 ft lbs.

Current limit 252,000 ft lbs

battery connected

2.8116

1.0934

1.9056

2.8116

.6990

1.5106

Wt no 1 620 gms 12.4 grains

571 gms 5 grains

9.30

6.55

235

124

1.55

.1218

26

Pinside

78.9

76.7

2.2

comp 15.5

15

Outside

78

76.4

2.6

3.1424

7.8077

1.1761

9.3262

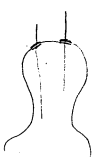
2.6

0.4850

7.8277

1.1761

9.4008



160

314
2.9 capacity vessel
.25 water in vessel
.7 capacity stirrer
.6 water in stirrer
3.845 lbs of H_2O

2275
2175
.5025
265
265
2.915

161

April 13 1900

Put 314 lbs. in large
160 " " small

152 Gas
23
129
103.25
81.75
314 lbs of H_2O
in large calor

105
23.25
81.75

Small calor

182 grms
22.175 mt
159.25 mt
Stirrer water -
2.5 capacity
.5 Stirrer water
.25 water vessel
3.75
163.00

.0648
45
3240
25 92
620.2916 No. 1.
568 324
1188.6156

.0648
.3240

Plate 1 620 gms 4.5 grains
Plate 2 568 gms 5 grains

Resistance 1.21 Ohm
Large stirrer 1.14 Ohm m H_2O at
2.94 Temp 61°.5 F

Small stirrer nearly dry
weighed 7.25 lbs.
The vessel was taken out
weighing 6.6 lbs.
Page 147 Large stirrer
weighs 7.2 lbs
Vessel 46°

Resistance small stirrer
.70-.07 = .63 Ohms
m H_2O

265 - 264

264.5 × 15 = 13225
260 × 15 = 1500
260 × 6 = 3906
259.5 × 30 = 7785.0
396 7.5
3906
3785
60) 15585
260.9 average outside

20 (52.25
comp 2.612 — 9.5931
1.079 — 0.0020
260.9 — 2.4164 — 9.5961
2.0325
103 Volts

20 cells = 65 - 64
Made magnet on machine = 45d.

20 cells = 52.5 - 62
Def on machine 301 - 300

3-27 Temp small calor 62° F.
Large calor 62.1 F.
3 32 Calor down 62.5.
3 35 61.9 F Large calor through stirred.
~~3 36~~ 62.4
3-36

985

705 lbs
5
3525
3525
3525
3550
3580
2175
22980
60 | 428860
714 lbs

985
714
271,000 ft. lbs.

716
5
3580

725
3
2175

715
5
3575

710
5
3550

715
32
15330
7145
22980

3-39	Started
3-40	35° 53' Elec Dyne
	705 lbs on dyne Elec
	840
	650
	1490
	745
	change Dynes
3-45	31° Elec Dyne
	182 Howell shaft shaft
	185
3-47	185
3-48	716 Dyne
3-50	32° 30' Elec
3-50	705 dynes

168

comp 76 8.1192
131.5 2.1188
.163 7.7993
1.09 0.0373

1.09 ohms in please 1.14 ohms measured

131.5 2.1190
9.5961
1.7151
1.7151
1.6464
comp 1.14 0.9438
5.0197

104.500

169

Galvo
Galvo

Total 265-264
Large calor 131-132

3-52 Air 76° F 76 / 64 / 90° F
62
14

4— Small cal or on galvo.
77-75

4— 710 lbs dyne
183
183

Fr. 8 725 lbs dyne

4-9 260 - 260

410 715 lbs dyne
184 speed shaft

133
comp 77.5

133
77.5
comp 210.5 7.16768
259.5 2.41141
.0909

90 90.8
61.9 62
6 28.1 60 28.8
4.68 .48 per minute

Large small

318.415 2.5031 × 163. 2.2122
77.5 2.8893 77.5 2.8893
.4658 7.6702 .48 7.6812
5.0626 4.7827

115.500
60.620
176.120

60.620
5.2458
.0909
5.3367

Color
217,000 Hills

4-18 Large color 133-133
4-19 81°7 Large
4-21 92°57 Small color
Small 77.5 76
4-27 Total outside
260-259
4-29 85°67 Large color
88°77 Small "
260-259
4-32 Stopped
4-39 Large 90°7
Small 90°8
296-295 " Wt. 4

172

.0648
674.0648
512.3392
11869040

2.8116
0648
5392

1188.616.
1186.404
2 [2.212
.106

674.065
620.29
53.775
1.106
60 | 54.881
9.1.4.7
seconds 19.5
Note 103

568324
512.379
55.945

2.9613
8.7100
2.0125
1.6460
5.3302

No allowance for batteries
3-14 hours ft lbs

173

No. 1 674 grams 1 grams
No. 2 512 grams, 4 grams

Large stirrer	8 lbs	wet
small —	7 1/2	—
Large calor	26 1/2	—
small —	.23	—
Large stirrer	7 1/2	nearly dry
small —	7	—
Large calor	26 1/2	dry
small —	22 3/4	
Large stirrer	6 lbs 15.5 oz	thoroughly dry
small —	6 lbs 6 oz	—
Large vessel	26 lbs. 6 ozs	
small —	22 lbs. 13 ozs	

22 13
6 6
29 days

Chem pure cell with siphon
1.42 on Elec

Standard 1.37 on Elec

~~Dynamo and Exciter~~

Magnets of such strength as to give $\frac{280}{3}$ Volts from armature this plate was of china running 1700 revs.

~~Flat wire~~ ~~Flock plate~~ machine running countershaft

3 meters /

field left on countershaft made 148 revs before stopping after armature clutch field off armature off

243 revs

field on brushes off

161 revs.

Thin plate running
1037 plates

Field off armature on brushes on
336

Field on brushes off
295

Field on brushes on
277

again 269

New machine

Field on very weak
from reversing

D = 0.845

182

183

after bringing up
476 field un
465

Field and immature
off 759

19° 45' 2 | 7.15288
4.7644

15° 5° | 9.50896
4.75447

15° 30 | 9.44592
4.72296

14° 30 | 9.39560
4.69780

14° 10 | 9.47162
4.70954

14° 20 | 9.48102
4.71451

16° 20 | 9.48425
4.72462

145
17
6 2 3 5
140
20 7 5
1 4 3 8
1 0 5
35
25 10

14° 3
1 5
4 1 5

.581 2 / 1.162 2
.568 1.5 / 2 8 4 0 3
.5 6 8 2 / .8 5 2 0 1.5
.517 2 / 1.034 2
.500 3 / 1500
.511 2.5 / 1022
.520 1.5 / 2800
.530 2 / 1.060

14
1.5
22

Plate 3 | Plate 4 1588

549 grams 2 grams

Plate 4 5 [illegible] 12 grams

Plate 3 5 [illegible] 1.5 grains
— 4 5 [illegible] 12 grains
Saiva
135

11:29 [illegible]
11:30 19° 45' 140
11 32 18° 53' 138
-33 15° 35'
-35 14° 20'
11 39 13° 10' 135
11 40 15° 45'
11-41-42 16° 45'

2
1.5
3
2
1.5
2
1.5

altimeter instant

9.45758
4.72879

9.46356
4.72178

9.46594
4.72297

9.47205
4.73502

.548
2
1096

1096

.539
2
1078

2

.560
2
1080

.548
3
1.629

1,1062
.8512
1.0344
1.5006
1.0222
2.600
1.060
1.095
1.096
1.078
1.080
1.629

25 | 15.209 | 36.08
150
209

log 608 4.78389
7.56560
36.6 3.21829

11-44 2 15° 40'
11-45 2 15° 41'
11-48 2 16° 56'
11-50 2
11-52 2 17° 10'
11-54 3

No. 4 Cu 563 grams 14 grains
No 3 530 grams 7 grains

.0648
14
2592
648
.9072

.0648
7
.4536

No 3 530.453
No 4 563.907
1094360

188

.0648

Plate 3 — 4'

548.0972
546.777
1094.874
1094.360
514

.0648 × 1.5 = 3240 + 648 = 09720

.0648 → 0648 → 12 → 1296 → 648 → .7776

½ = .257 Loss

31640 / 4606 / 1/5th

old 548.097
new 530.453
77.644
.257
17.901

	17.901	4.2529
Comp	.25	8.6021
Comp	19.5	8.7100
		1.5656

367

---

497 · 6 / 5.4 / 11.4

189

wo 497	2.6964	
lbs 11.4	1.0569	
feet 6	0.9031	
	4.6564	

45,000 ft. lbs. outside

200 on H.P on motor
66.6 Volts

Dyn 11° 35' — 9.3027
4.6513
3.2189
27 Webers — 1.4324
66.6 — 1.8235
1.6464
7.9023

79.800 ft lbs given machine

4.6564
4.9023
.7541

56% on outside work

190 25°	9.6259 / 4.8129	.650
22° 25'	9.5813 / 4.7906	.617
18°	9.3521 / 4.6760	.474
~~14° 3'~~	~~9.4049 / 4.7024~~	
18° 40	9.5052 / 4.7526	.566
20° 18	9.5402 / 4.7701	.589
21°	9.5543 / 4.7771	.598
21° 10'	9.5576 / 4.7788	.601
19° 45	9.5288 / 4.7644	.581
20° 25	9.5426 / 4.7713	.590
		9 | 5.2 66
		.585

4.76716
1.58731
3 1 18406

Test Motor No. 2 191

	Constant	Dyne
3-13	Stanford	139
3-14	25° E.D	140
3-16	22° 25'	145
3-17	43°	
3-18	14° 42'	156 / 145
3-20	18° 40	143 / 141
3-22	20° 18'	129
3-24	21°	140
3-26	21° 10'	[illegible]
3-28	19° 45'	103
3-30	20° 25'	
3-31	Stripped	
3-13		
18		

192

.0648
4.5
3240
2592
.29160

.0648
13.2
1296
1944
648
.855536

321)480 (1.4
321
159

424
1 1
676
212
89936

544.291
530.453
13.838
563.907
540.855
13.042
13.838
26880
13.440 Grams

544.292
540.855
13.440
comp 18
comp 19.5
36.3 Webers

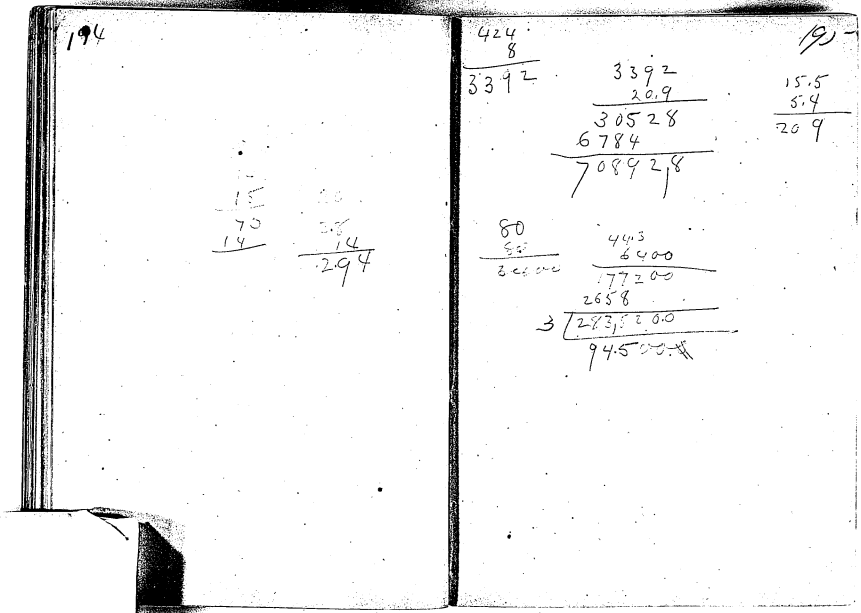
13.1283
8.7448
8.7100
1.5831

193

Plate 3 544. grms 4.5 grains
Plate 4 549 grms 13.2 grains
Elec. Depn. .09 Ohms

321 Countershaft 1/2 min
480
642
960

113 revs 1 min
4
452 revs
14.75
106
4
424
15.5


194
424
8
3392
3392
20.9
30528
6784
7089.28
15.5
5.4
209
80
5.2
416.00
443
6400
17720
2658
3 | 2835.20
945.06.4
15
70
14
5.6
14
294

220 HP
544
6 1/4
10° 10' Elec Sync
10° 30'
285 1/2 rev
220°
6 lbs 6 lbs
10°35'
559 rev

Magnet above 102 Volts.
Battery connections 15 Volts
Opposite — 1R Volt
1 cell of Daniells internal
resistance 2 ohms Con-
Battery
Battery taken off 1L Volt
Cell carbon filled and
Daniells 25 Volts R

Photometric test [illegible] 17. 1880.

81. Ohms in resistance [illegible]

Rivadavia [illegible] candles.

385. on high resistance

170. on [illegible] Edison and Lane

7. candles on the [illegible]

8½. candles 10% off the edges

17. candles Rivadavia,

178 on low resistance Lamp

175 on 4 Ohm

290 on H.R

Apl 17. Fr. 204

Photometer test Apl 17. 15.

Bank #129 cold. 119. Dimx.
On the Card 165
21. candles broadside.
8¼. " on edge
On lamp 170.
16½ on [illegible]
15¼. candles [illegible]
17.2.
273 " in high "resistance
175 on lamp
21. candles broadside.
270. on high resistance
P.M. 170. on low resistance
4.06 21. candles broadside
4.07 21.2 " "
4.09. One or two bad spots in carbon-
21.2 candles broadside

Apl 17. 15. 208

206

207

Safety catches

41 wires of lead-tin
bimetal [illegible] .654 m each

33° [illegible]

Page 190 constant
styne 3.18406

2 | 9.7361
4.8680
3.1806
1.6874

48.7 Webers

208

3 | 25·0
83·3 Volts

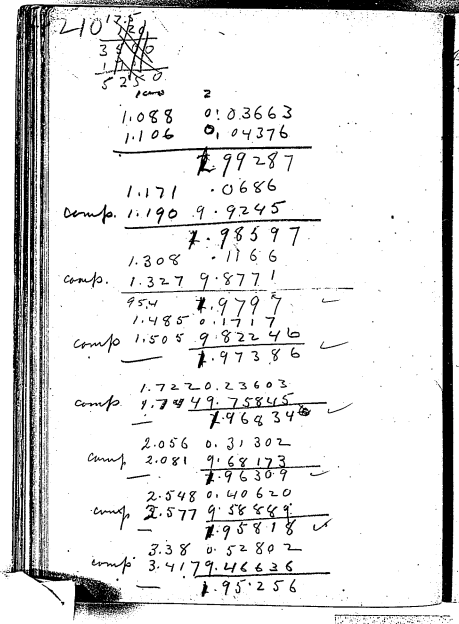
3 | 260
86·6

209

April 19

Lamps in Service

	Amps	HR	E.M.	Commutator
Osgood	144	255	135	7½
Davis	122	252	131	7½ New Mica
Osgood	157	250	125	6½
"	153	252	120	6½
Davis	170	250	110	8½
Osgood	163	256	117	8
Davis	140	255	128	3½
Davis	167	257	104	8
Osgood	173	260	90	9½
Davis	187	260	90	8¾
Davis	138	255	130	2½
Osgood	152	255	107	7
Davis	124	250	170 (?)	6¾
Davis	142	255	112	8



	1	2
	1.088	0.03663
	1.106	0.04376
		1.99287
	1.171	.0686
comp.	1.190	9.9245
		1.98597
	1.308	.1166
comp.	1.327	9.8771
	954	1.99797
	1.485	0.17717
comp	1.505	9.82246
		1.99386
	1.722	0.23603
comp	1.749	49.75845
		1.99834
	2.056	0.31302
comp	2.081	9.68173
		1.99309
	2.548	0.40620
comp	2.577	9.58669
		1.99818
	3.38	0.52802
comp	3.419	9.46636
		1.99256

	Cold Arms	High R	G.R	2 1/4 Cardus
Plain	125	255	—	8/4
Plain	146	252	112	11
Plain	133	250	118	4 3/4
Plain	158	252	100	11 1/2
Plain	128	250	120	8 1/2
Plain	129	252	125	7 1/2
Opaque	146	250	115	13 1/2
Plain	102	252	102	9 3/4
Plain	140	250	120	10
Plain	147	252	115	15
Opaque	205	255	75	2
Plain	150	255	115	15
Plain	145	255	120	7
Plain	123	255	130	9
Plain	142	250	140	3
Plain	139	255	133	4
Opaque	150	255	123	10 1/2
"	150	252	125	11 1/2
Plain	177	255	108	9 1/4

212

213

	Ohm	M.R	L.R.		Candles
Plain	131	255	150	(Dip)	25
Plain	119	250	160		11¼
"	129	253	135		6
Plain	119	253	150		8
"	153	250	115		6½
"	145	248	?		10

214

5.5
9.5) 55 (58 2/9
47 5
750

17) 9.5 (5-5 9/17
8 5
100

April 21 215

Face frosted globe
9 1/2 candles
Edge 5 1/2

Face
17 candles
Edge 9 1/2

Edge 56 % of Face

Page 207. Safety clutches

.042 wire 28° Elec
degree red hot

35° made the
No 12 wire for main
wires on the Columbia
as warm as ~~of~~ of apply
the paint

50 Webers about

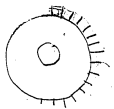
Faradic machines

July 2 1

~~Let n = no. coils~~

~~turns commutator~~

Let n' = no. ~~commutator~~ turns



$R = f(n)$

$R \propto \frac{1}{\text{cross section}}$

$R \propto \frac{\text{length}}{\text{cross section}}$

length $\propto$ ~~no. commutator~~ no. turns

cross section $\propto$ ~~no. commutator~~ no. turns

219

$R \propto n^2$ ~~no~~

~~$R \propto n^2$~~

If depth wire is varied so that

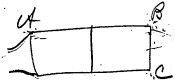
cross section $\propto \frac{1}{(\text{no. turns})^2}$

the

$R \propto n^3$

220

E. M. F. is proportional to the length of wire passed through the field



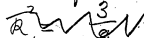
Let l = AB = length annulus

$E \propto AB$.

n being constant

$R \propto AB + BC$

n being constant



221

E. M. F constant.

AB variable

$n \propto \frac{1}{AB}$

$R \propto n^2 \propto \frac{1}{AB^2}$

$A \propto \frac{1}{n^2}$

$R \propto n^2 \propto \frac{1}{AB^2}$ at

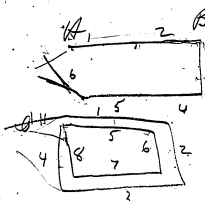
$R \propto \frac{AB + BC}{\text{at} + \text{b.c}}$

Cross section $\propto \frac{1}{n}$

$R^2 \propto \frac{AB + BC}{\text{at} + \text{bc}}$

$+ AB$ $\frac{AB^2}{at^2}$

AB = const



No. 2

No. 1

No 2 $\frac{6}{8}$ length No. 1

No 2 with $\frac{1}{2}$ resistance No. 1 per foot

No 2 $\frac{6}{8} \times \frac{1}{2} = \frac{3}{8}$ resistance of No. 1

$R \propto \frac{1}{AB^2}$

$A = 2$

$R \propto \frac{1}{4}$

AB = active portion

BC = inert

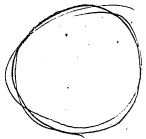
$R^2 \propto \frac{\frac{AB + BC}{ab + bc}}{\frac{AB^2}{ab^2}}$

$AB = 2ab$ $BC = bc$

$R^2 \propto \frac{\frac{2ab + bc}{ab + bc}}{4}$

$ab = bc$

$R \propto \frac{\frac{3}{2}}{4} = \frac{3}{8}$



Diameter varies

$E.M.F = f(d)$

n being constant

$E.M.F \propto n$

in same machine

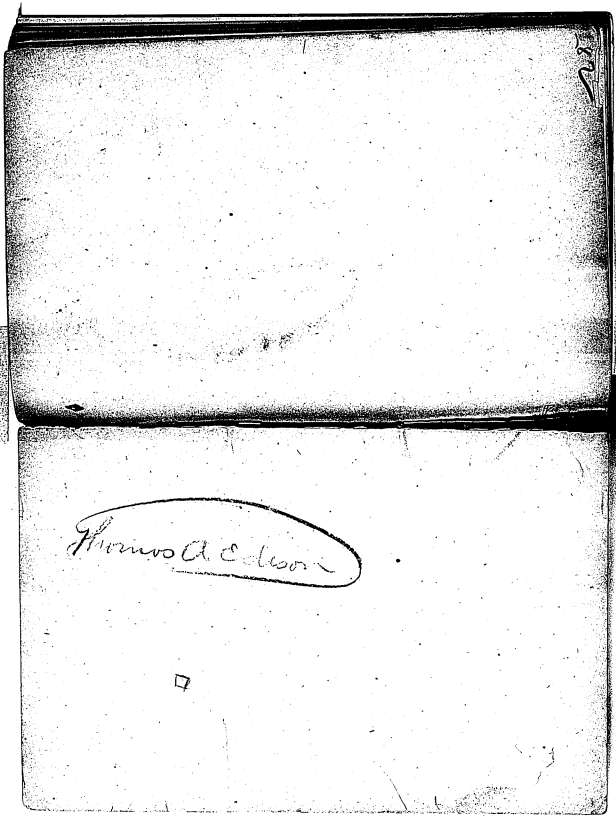
Same diameter

$E.M.F \propto n \times$ const.

$E.M.F \propto$ speed

$E.M.F = f$ (strength field)

strength $= f($


Thomas A. Edison

Menlo Park Notebook #83 [N-79-12-00]

There are no dated entries in this notebook with the exception of one entry for December 1879. All of the entries are by Samuel D. Mott. Included are notes on a preliminary estimate of the cost of a 10,000-light central station, notes and drawings relating to electricity and electric lighting, and notes and drawings of the telephone. The label on the front cover is marked "Private" and "S. D. Mott." It is also stamped "Edison Pioneers 40 West 40th Street New York City." The book contains 284 numbered pages. In addition, two loose pages, dated January 1888, were found in the book.

Blank pages not filmed: 22-23, 72-279, 282-283.

Notes and mechanical movements. Things to be looked-up and remembered both Electical and otherwise.

Scraps &c

EDISON PIONEERS
40 WEST STREET
NEW YORK CITY

Dec. 1879 1

Preliminary Estimate of the cost of lighting 10,000 Edison Electric lamps from a Central Station each lamp giving a light equal to 16 candle or taking the place of a gas jet consuming 5 cu ft per hour

Five hours use is assumed as the average for the year - In taking this figure it has to be remembered that during the day a large number of lights are used in dark rooms and during the night a still larger number are used from 8 to 12 hours. A gas jet which consumes 5 cu ft an hour burning 5 hours each day will consume 25 cu ft a third-time or about 9000 cu ft in a year

For convenience in making comparison with gas the electrical equivalent that is the amount of electricity which will produce the same light as 1000 cu ft of gas is here designated as M A year for example for Electric lamps is paid by consumer

2

9 M a year a 10 000 January 3

90 000 M per year. Hots shows that it is possible to obtain 8 lights from one H.P. Carnahy Ke-tell, 80 Watt for 10 000 lights - 1250 H.P will be required

Investment

Boilers and Chimneys - Bates, Milsey Sat.		£ 21 000
5 Engines	Astleys estimate	42 000
Foundations		2300
Iron Structure		7 000
Shafts pulleys &c		3900
Belts		4700
Wood flooring &c		3 000
Water heater and pumps		1 000
Iron floor and boiler supports		6 000
Radial Machines		24 000
Conductors		50 000
		£ 171 400

Total investment per M 1,900 £

Depreciation —

Boilers and Chimneys	10%	$2100
5 Engines	3%	1275
Foundations	1%	23
Iron Structure	2%	140
Shafts, pulleys &c	2%	77
Belts	16%	470
Wood flooring &c	5%	180
Water heater & pumps	5%	350
Iron floor & Boiler supports	2%	120
Tenoning machine	3%	720
Conductors	2%	1000
		6425

Annual depreciation $ 71405

Labor

Per day 2 Engineers 6
" Firemen 10
" Drivers 3
" Regulator 3

Operation may be taken ½ the aggregate or 11 7

Total 33.

On day 33. or 13.2 Cts per M. total

It is recommended that a Remark must be charged yearly for each Lamps enough to pay for breakage and attention.

Coal

Dust Coal is taken as costing 3/50 a ton under the boiler that is including labor of stoking; 3 lbs of coal are from are required for one H.P.

29.30 for Coal per day

11.7 Cts per day.

Water for boilers waste oil &c estimated as costing ⅓ of Coal

3.9 Cts per M

— Rent Taxes and insurance —

10.000 a year for the cellar and first floor of a building 100 x 50 ft. in any locality near the place required

11.1 cts per M

Summary

Depreciation	7.14
Labor	13.2
Coal	11.7
Water	3.9
Rent Taxes & Insurance	11.1
	47 cts per M

If I. E. the cost of the light delivered to the Consumer will be 47 cts per M

Selling light alone the dividend will be —

At	50 cts per M	15-7/10
"	60 " " "	7 7/10
"	75 " " "	15 7/10
"	90 " " "	23 7/10
"	100 " " "	31 7/10
"	125 " " "	41 "
"	150 " " "	54 "

Power Estimate-

It is estimated that 400 H.P. can be sold during the day for various purposes, small shops Elevators Lathes Sewing Machines pumping &c 10 hours Average use is assumed.

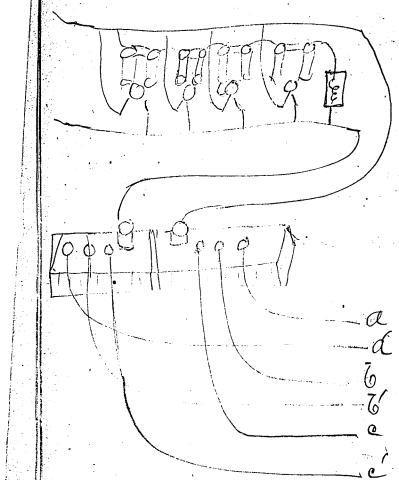
The cost will be simply the cost of Coal under the boiler Water &c. $12,500 will have to be invested in additional Conductors. Power is sold today in N.Y. at $1,50 a year or 5 Cts an hour or at the rate of 83 Cts per M. The Electric power has the advantage, it costs only when used

When light and power are sold at-

50	Cts per M	dividend	11 %
75	" " "	"	33 "
100	" " "	"	59 "
150	" " "	"	90 "

2 00 H.P. sold at 1,00 per M.

In the U.S. the average cost installed for a thousand lost manufactured is a year for Gas 9,00 Electric light $1,90 - Cost per 1000 lost to consumer Gas 85 Cts Electric Light 47 Cts



The estimate for Newcastle at present is according to Mr. Lea - 24 stations Costing £80 000 each and 8000 lamps to be supplied from each Central Station —

Mr Edison's analogy for the intensity of a Current and the Electromotive force of a Current is that a belt moving at a certain velocity is as the E M F and the intensity is measured as the width

Connected in Series

Intensity or E.M.F

in Multiple Arc

THE WHEATSTONE BRIDGE.

50
100
100
100

16

Sizes of Bond Paper

Lindenmeyer

16" x 21"
17" x 22"
19" x 24"
14" x 17"
17" x 28"
19" x 30"

Keuffel Paper Sizes

16" x 21"
17" x 22"
18" x 23"
19" x 24"
23" x 28"
23" x 36"
21" x 32"
16" x 42"

Heating Effects in an Electrical Circuit

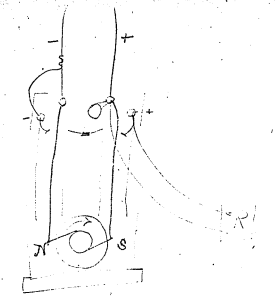
If the resistance is doubled the heat is increased $\frac{1}{2}$; if the Current is doubled the heat is quadrupled

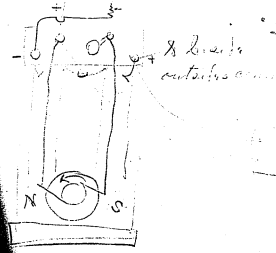
Blue Printing Solution

40 grammes of Water
5 Ammonia iron Citrate
3 Ferri cyanide Potassium
grammes = Cut h

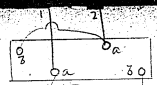
Angle of Repose

Bricks & Stone	between	31° & 38°
Woods	"	12½° & 25°
Metals		8° to 11°
Augers		3° " 6°





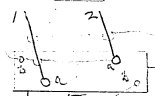
Commutatore



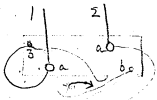
A Dynamo

1,2. Main
a Armature
b Field
(reversed By)

A Dynamo



B Dynamo



B Dynamo

Farad = unit of Capacity for Electrostatic charge

Ampere = unit of quantity of Static Charge

Coulomb = " " attraction of a magnetic pole

Ohm = the resistance offered by Column of Mercury in a glass tube of 1 Meter long (40 inches very nearly) & 1 Sq Millimeter Diameter .021 in diameter at a temp of 32° F

Volt = the EMF necessary to decompose 1/2 Milligram of water, or 1/3 of a Milligram of Copper from a Sulphate of Copper Solution in an Electrolytic Bath —

Absolute unit- a force which acting for a second would give a weight of 1 Gram mass a velocity of 1 Meter per second

Formula to determine the weight of Metal deposited in a given time

a = Atomic weight of any metal in a Salt submitted to Electrolysis (.3246 Milligrams Copper Comm. per in 1 Sec by 1 Amp)

R = resistance

E = EMF in volts

t = time in seconds

Weight of metal deposited in t seconds is

Grains = $0{,}000158 \frac{aEt}{R}$

Barnard's 1.888 volts Clarkonite's 1.48

Volt = 1.079 Daniell cell in perfect order

A volt of EMF press one liter of current through a circuit of 1 ohm resistance requiring to do so 4673 ft lbs of energy which development of 1 unit of Heat in 6.338 seconds the heat set free in the exact measure of the work

Prof Benjamin

Weight of Copper 555 lbs per mile Cross section of copper cu in = 32.12 lbs

Resistance of 100 yds of iron wire #8 is roughly 1 ohm — Resistance of 1 mile of ordinary telegraph line 17½ ohms per mile

No 9 Telegraph " 12 " " "

The energy required to overcome 1 ohm Resistance is 4.673 ft lbs

ft lbs required in an Earth Loop 140 ohms Resistance with 105 volts is 3957.62 ft lbs

4½ Foot units on Sim Arc by Daniell Cells

$$\text{ft lbs} = C^2 \times Rt \times .737335$$

C = Ohms of Current

t = Time in Seconds

R = Resistance in Ohms

$$\frac{C \times E}{745} = \text{H.P.}$$

0.737335 = ft lbs of

1 Volt for 1 Ohm per second

R = Resistance

C = Current in Volts

t = time in seconds

$$\text{Foot lbs} = \frac{E^2}{R} t \times 0.737335$$

$$\text{Foot lbs} = \frac{(\text{Volts})^2}{R} \times 44.3 \text{ before}$$

1 Volt through 1 Ohm = 1 mm

$$\text{H.P.} = \frac{(\text{Volts})^2}{R} \times 44.3$$

Resistance of one Circular Mil foot of pure Copper = at 60° F. = 10.334

Same for Commercial 10.64 at 60° F

Resistance of Circular Mil foot of pure copper at 32° F. = 9.740732 Ohms

V.

A Circular Mil is the area of a wire as viewed from one end treated as a whole number & divided by the Constant .7854 or D^2 = Circular Mils.

(To find the diameter d of any wire)

Mils of the Grains per foot by Constant 47.1936 this gives the sectional area in Mils; and the diam in 1/1000 of an inch

= Sq root Rem/12 $d = \sqrt{\frac{M}{\text{Constant}}}$

The resistance of a copper wire 1/13 inches diam the length of the circular inch is 22165.50 ohms = 1 (24800 miles) is

10.33 = The resistance of a circular Mil to 1 foot

R = Resistance
L = Length of wire in feet
A = Sectional area in Circular mils

$$R = \frac{10.33 \times L}{A}$$

$$L = \frac{A R A}{10.33}$$

$A = \frac{L \times 10.33}{R}$

Ohm = unit of quantity of electricity or that which passes through 1 ohm in 1 second with a difference of Potential of 1 Volt

C = Ohm
E = Volts
R = Resistance

$$C = \frac{E}{R}$$

$$E = C \times R$$

$$R = \frac{E}{C}$$

For measuring the resistance length or diameter

L = length of wire in feet
R = Resistance in Ohms
d = diameter in thousandths

$$I = \frac{R d^2}{10.79}$$

$$R = \frac{10.79 L}{d^2}$$

$$d = \sqrt{\frac{10.79 L}{R}}$$

Formula for Calculating Resistance R at temperature t from the resistance r at 0 Cent.
t = temp in degrees Centigrade

$$R = 9.740732 \left(1 + .003824t + .00000.1268t^2\right)$$

9.740732 = R on one mil foot of pure Copper wire at 0° Cent 32 Fah.

Specific heat of Copper 0.1013 .0939 Spec. ht
Melting " " " 1091° Cent
" " " Lead 298° "

Specific Gravity of Copper wire = 8.899

Heating Effects

C = Current in Ampers
R = Resistance in Ohms
W = Weight in grammes
S = Specific heat of Metal
H = Rise in temp per sec. in degrees Cent

$$H = \frac{0.24 \cdot 065 \times C^2 \times R}{W \times S}$$

32 Resistance of conductors are directly as their Lengths & inversely proportional to the Sections

A 2% loss as Central Station Mile 45 formula is 7.231 x N x L
5% loss 2.803 x N x L ÷ 17956 =
Number of No 10 wire required

Resistance of any given Copper wire @ 1 mile long weighing N grains =
$\frac{1}{.001516 \times C^2}$

The Resistance (total) of a number of resistances in Multiple Arc = 1 divided by the Sum of the Reciprocals of Resistances —

Formulas for Calculating Diameter of Conductor for Edison Lamps 140 ohms Resistance
Diameter in mils at 2% loss = $\sqrt{7231 NL}$
" " " " 5% " $\sqrt{2803 NL}$

N = Number
L = distance from Mains

Resistance of any Number of Edison Lamps in Multiple Arc (the resistance of Conductors not taken into account) $R = \frac{r}{N}$ R = Total resistance N = Number of Lamps r = resistance of each Lamp

Formulas for Calculating Diameter in Thousands of Conductor for a number (N) of Edison Lamps of resistance (R) at a distance (L) from Mains with (P) per cent Loss

$X = \sqrt{\frac{20.66\ LN(100-P}{PR}}$

Area in Circular Mils $\frac{20.66\ LN(100-P}{PR}$

Battery Resistance 35

Grove	.41 ohms
Carbon	.63 "
Daniell	1.70 "

The quantity of Electricity which is denoted by unity in calculations based on Electro magnetic or dynamic phenomena is nearly 30 000 000 000 times as great as the quantity denoted by unity when Electro Static phenomena are taken as the basis of measurement

An ounce of coal contains	695 000	ft lbs of Energy
" " Gunpowder "	about 10 000	" " "
" " Zinc	113 000	" " "
" " Copper	69 000	" " "
" " Hydrogen Gas (Combined with Oxygen that will Decompose water)	9 25 000	" " "

To decompose water it is to take away a single grammne of hydrogen from the Oxygen with which it is combined requires no less than 95 050 Webers Jamont

SP Thompson

Variations of Resistance

Temp Fahr.	Temp Cent.	Resistance per mile-foot	Per cent increase from 32° Fahr. or 0°C
32.0	0.	9.74073	.0000
35.6	2.	9.81527	.0765
39.2	4.	9.88992	.1531
42.8	6.	9.96466	.2299
46.4	8.	10.03950	.3060
50.0	10.	10.11444	.3836
53.6	12.	10.18948	.4607
57.2	14.	10.26462	.5378
60.8	16.	10.33985	.6151
64.4	18.	10.41518	.6924
68.0	20.	10.49061	.7699
71.6	22.	10.56614	.8474
75.2	24.	10.64176	.9250
78.8	26.	10.71749	1.0028
82.4	28.	10.79332	1.0806
86.0	30.	10.86923	1.1585
89.6	32.	10.94525	1.2364
93.2	34.	11.02137	1.3147
96.8	36.	11.09759	1.3927
100.4	38.	11.17390	1.4712
104.0	40.	11.25031	1.5497
107.8	42.	11.32682	1.6285
111.2	44.	11.40343	1.7069

114.8	46	11.480 14	.1 7847
118.4	48	11.556 94	.18645
122.0	50	11.63384	.19435
125.6	52	11.71087	.20224
129.2	54	11.78794	.21017
132.8	56	11.86514	.21806
136.4	58	11.94244	.22603
140.0	60	12.01983	.23397
143.6	62	12.09732	.24193
147.2	64	12.17491	.24990
150.8	66	12.25260	.25787
154.4	68	12.33039	.26586
158.0	70	12.40828	.27385
161.6	72	12.48626	.28186
165.2	74	12.56434	.28987
168.8	76	12.64252	.29790
172.4	78	12.72079	.30594
176.0	80	12.79917	.31398
179.6	82	12.87765	.32207
183.2	84	12.95621	.33010
186.8	86	13.03485	.33878
190.4	88	13.11365	.34624
194.0	90	13.19252	.35436
197.6	92	13.27148	.36247
201.2	94	13.35054	.37057
204.8	96	13.42970	.37872
208.4	98	13.50896	.38685
212.0	100	13.58832	.39500

Note Mr Dowson's valuable process for making Cheap gas for motor purposes. Prof Dewar

Prof Ayrton reported that with a series of trials Made with a 3½ HP (Nominal) Otto engine driven by Dowson's gas 1 HP (indicated) was obtained for hours by the consumption of gas derived from 1.4 lbs of Coke — for larger engines he anticipates a consumption of only 1.2 lbs

Edison Lodge machine 125 HP 350 revolutions per min E.M.F. 110 volts — Resistance of the field Magnets 30 ohms resistance of armature .008 of an ohm. dia of armature 28 inches Core composed of 1700 thin iron discs the function of which is to concentrate the field in the space through which the conductor moves — the armature is insulated by paper discs which is done to avoid the heating effects due to the so-called Foucault currents induced in the metal and absorbing or wasting energy — instead of being wound with coils the armature is wound with 56 38 solid Copper bars 3/16 by ½ inch section 3/4 ft long Carbon brush 6 inches long 1.4 ohms resistance Field a current of .8 of an Ampere maintains it at 200 ohm 51 lamps a light of 16 candles

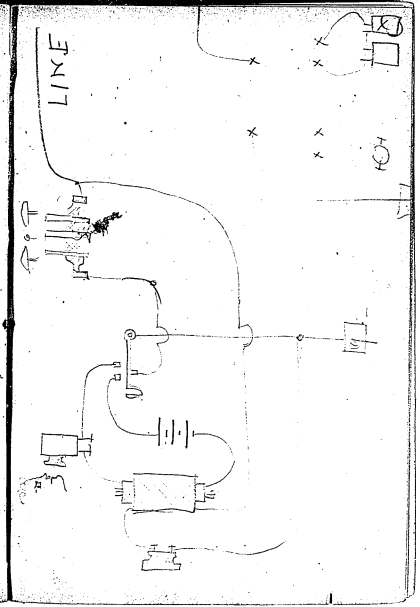
Preece

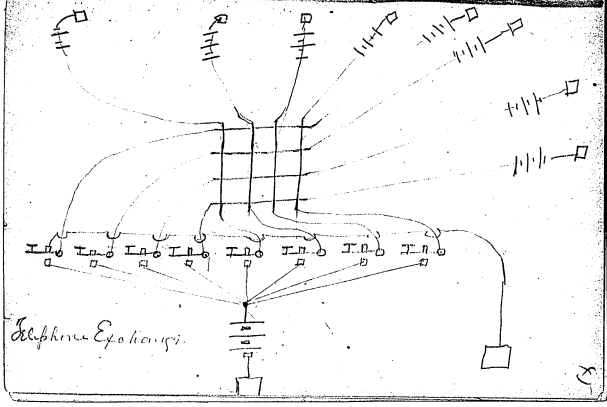
12 In primary coil is ordinary
Telephone the primary is from
2/10 to 6/10 of an Ohm — the Secondary
is from 130 to 190 Ohms

Electrodynamic or Galvanic induction
discovered by Faraday in 1830

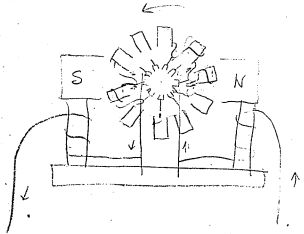
A current which begins, a current which
approaches, or a current which increases in
strength, induces an inverse momentary
current in a neighboring conducting circuit —
& a current which stops, a current which re-
tires, or a current which decreases in strength,
induces a direct momentary current in a
neighboring circuit — Direct —
The intensity of the induced current is proportional
to the strength of the primary & depends
upon the distance of the Secondary from primary
& upon the length of wire subjected to induction
action —

Electromagnetic induction — Bibliography



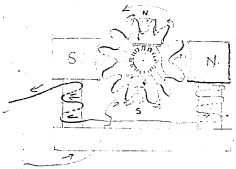

Telephone Exchange

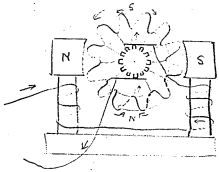
46

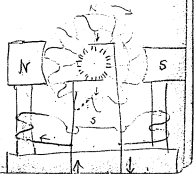


As a generator / for
Alternating current
Dynamo

As a motor







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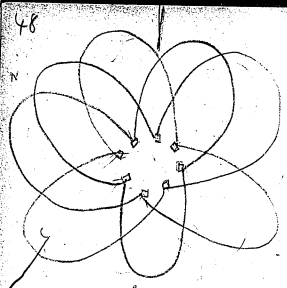
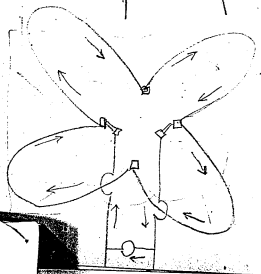
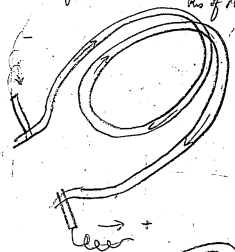




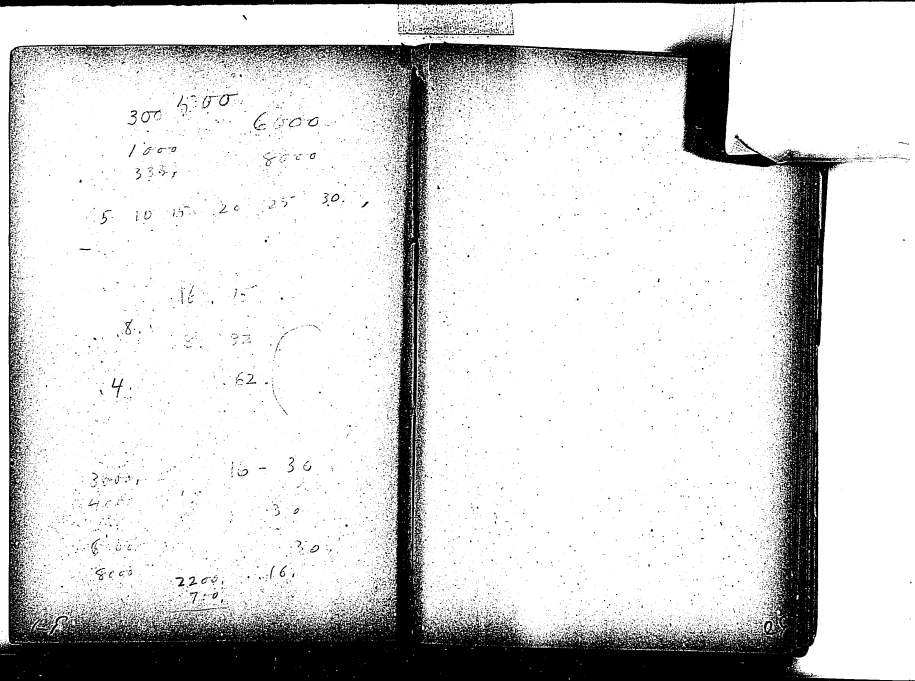
49

"A" Coil machine. 14 Ohms Resistance
Rs of Field



.04 Brass Plug

Large machine. 0.38 Ω



A - 50 light-for B lamps

B - Brush Type dynamo 1000 lights ~~Type 7 H~~

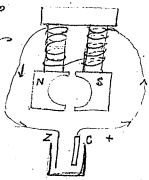
C 1250 Century Station Dynamo

D 50 light-dynamo Manna Station B lamps

E 100 " " " " B "

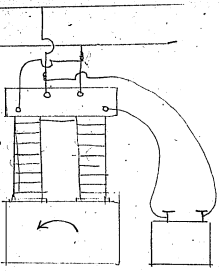
F 200 B lamps

Z 60 A lamps



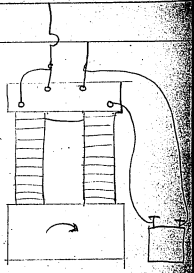
"A"

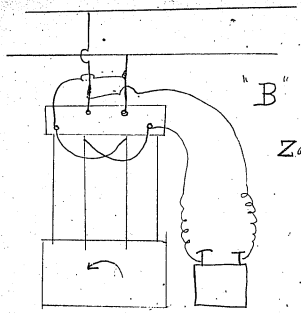
Z dynamo



"A"

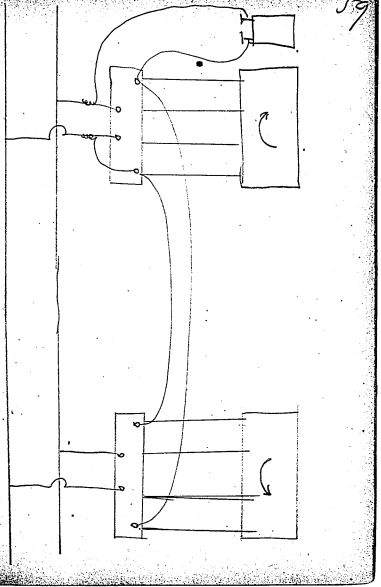
Z dynamo

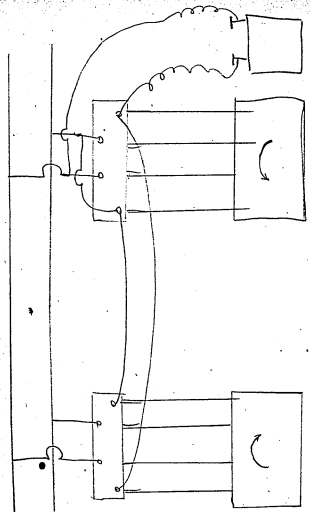


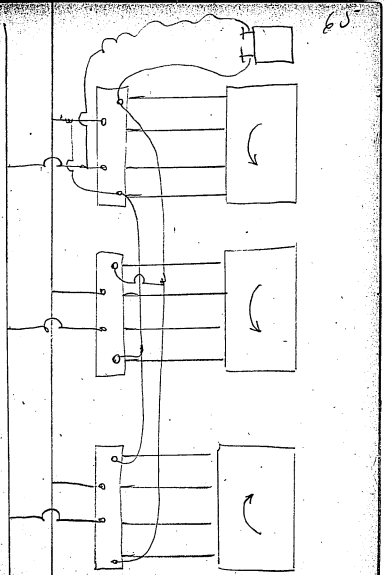

"B"
Zdynamo

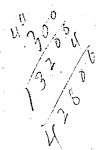
56

57









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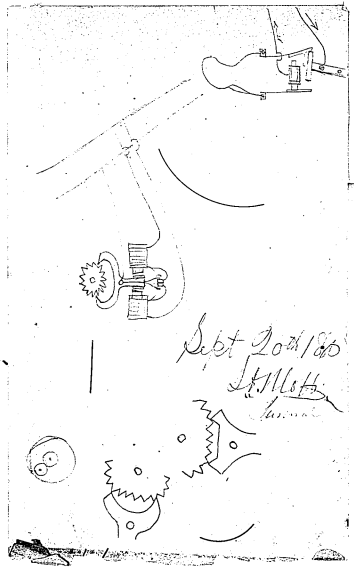
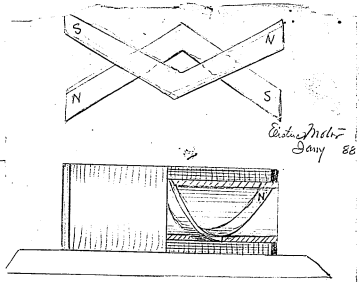
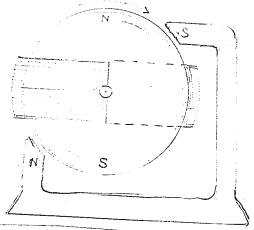
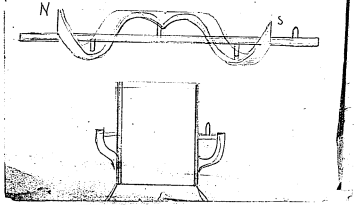
[ITEM FOUND IN BOOK]









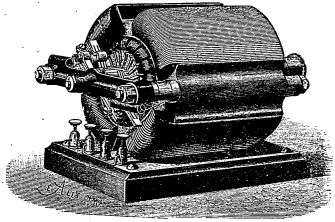


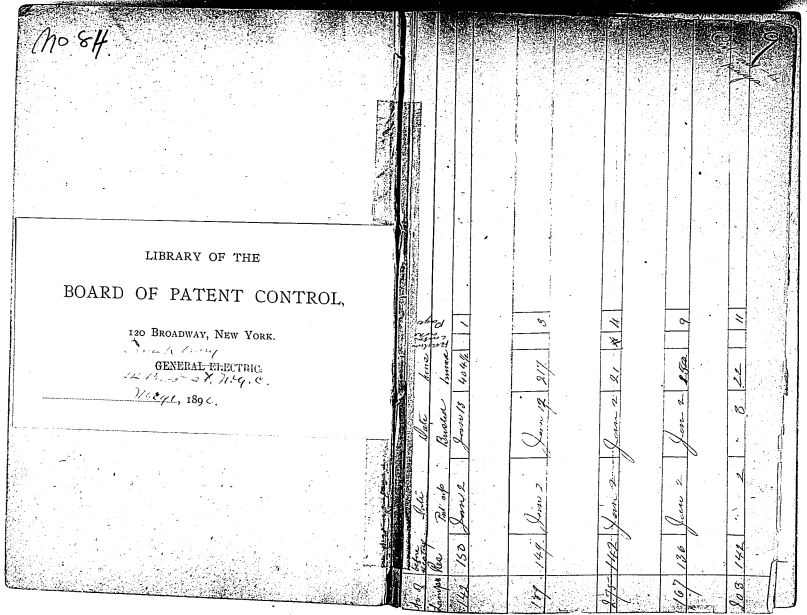
Fig. 2.

Menlo Park Notebook #34 [N-80-01-02.4]

This notebook covers the period January-May 1880. Most of the entries are by Francis Upton. There are also a few entries by Edison. The first 53 pages contain a record of experimental lamps burning at Menlo Park in January 1880, which was kept by one of the laboratory assistants, possibly Albert Herrick. The remainder of the book consists primarily of calculations by Upton about electric lighting. There are also a few notes and calculations relating to electric meters and a few drawings of lamps, including some by Edison. The label on the front cover is marked "Record Condensed," "Lamps," and "Herrick." The book contains 288 numbered pages.

Blank pages not filmed: 80-83, 94-125, 130-286.

Missing page numbers: 1-8, 37-38, 43-44.


No 84
LIBRARY OF THE
BOARD OF PATENT CONTROL,
120 BROADWAY, NEW YORK.
GENERAL ELECTRIC.

No.	Weight Adopted	Week Ending	Week No.	Total Number Examined	Number Rejected	Page	Remarks.
186	138	Jan 2	Jan 1	204		21	
211	139	Jan 2	Jan 2	176		22	
147	145	" 2	" 2	98		23	Ill'o h 8 gas. fds
198	117	" 2	" 15	279			
143	136	" 2	" 6	82		20	

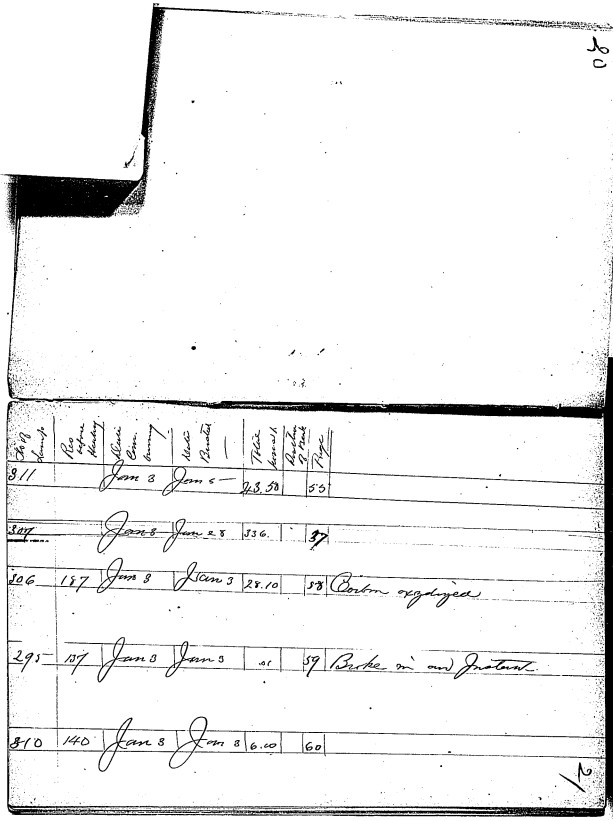
No. Assign.	Book Ops. & Form	Value Book	Value Assessed	Taxes Paid Year	Page	Remarks
130	Joint 2	Joint 5	~~3935~~ 2755		24	
151	" 2	" 2	65.00		25	
181	" 2	" 3	43.00	6	26	
147	" 2	" 2	69.00	Y	27	
160	" 2	" 5	17101		28	

Old Book Number	New Number	Name of Pupil	Name of Parent	Name of Teacher	Number of Lessons	Number of Absences	Page	Remarks
206	142	Jane 2	Jane 2		49		30	
210	127	" 2	" 3		60		34	Attd Summer at Campfire
163	135	" 2	" 3		60		35	
196	117	" 2	" 2		60		36	
285		" 2	" 3		48		39	

Log Page	Rec'd from	Date sent out	Date Rec'd	Total Amount	Postage	Page	Remarks
299	145	Jan 2	Jan 2	46.10	1	40	
301	Comm. # 299	" 3	" 3	56.20		86	Personally Entrusted by E. on P.S.
303	Comm. # 145	" 2	" 2	1		47	Personally Entrusted by Engineer on P.S.
244		" 2	" 2	1		48	
300	145	" 2	" 3	48		23	

Book No.	Date Entered	Date of Experiment	Name of Experimenter	Name of Substance	Remarks
443					Broke by burning off from Glass Tower Small carbon
462		375	Tho Jeeble	Coffee	Quite experienced Analyst Jon Adams, Bank note small carbon examined Unstopped in white paper
608		Jan 28	1850	Glass	Tube and closed for cross for Chem. Laboratory
"					

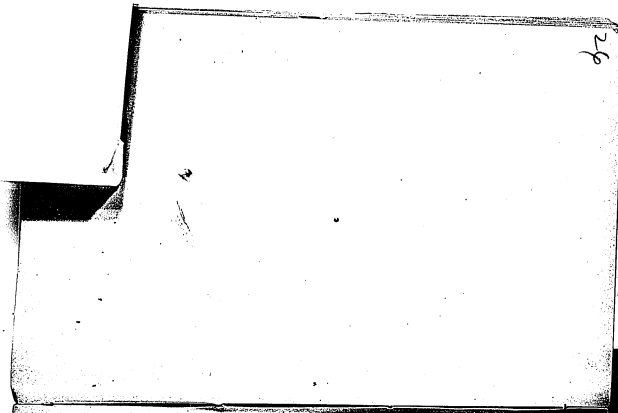
5



Date Entered	Page in Ledger	Name of Customer	Name of Purchaser	Total Amount	Amount of Trade	Price	
8/11		Jam s	Jam s	43.50		50	
8/17		Jam s	Jam s	33.6		37	
206	137	Jam s	Jam s	28.10		58	Barton exchanged
295	137	Jam s	Jam s	.01		59	Burke in and Instant
8/10	140	Jam s	Jam s	6.00		60	

No of Trough	Time after Planting Last Jam	Date Last Jam	Date Inserted	Max Inches Inserted	Feet Flow Per Sec	Remarks
812	142	Jam 9	Jan 6	42.45	61	Broke by Jam in Trough
214	195	Jam 3	Jam 2	244.05	62	
240	124	Jam 5	Jan 9	102.17	63	
264		Jam 4	Jan 14	187	65	
284		Jam 4	Jan 4	134	66	

Ch & Journ	Pg.	Date Journ. Ent.	Date Journ. Ent.	Date Trans.	Page Journ.	Page Trans.	Remarks
265	147	Jan 8	Jan 13	1738	7	67	
223		Jan 4	Jan 4	1140		69	
104	126	Jan 4	Jan 5	1257	10		Olde Champion Book registered
326	135	Jan 4	Jan 5	1240	71		
315	239	Jan 5	Jan 9	1242	72		



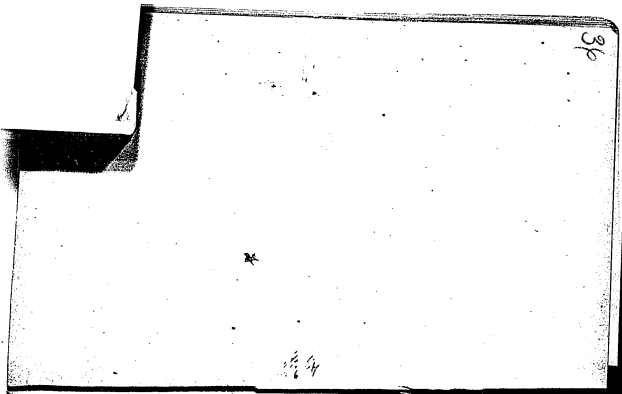
Ord. & Journ.	Rec. before Hearing	Rec. since Hearing	Weight	Grain Taste	Grain Husk	Portion Endo.	Portion Peric.	Remarks
316	185	Jam 5	Jam 16	146 d		75		
317	144	Jam 5	Jam 5	16.4		78		
318	152	Jam 6	Jam 7	25		75		
825	146	Jam 5	Jam 9	17 1/2		79		
827	170	Jam 5	Jam 5	15.97		80		

No. of Test	Gauge Reading	Date Put in Ground	Date Taken Out	Date Tested	Total Time in Ground	Rainfall	Temp.	Remarks
322	150	Jan 5		Jan 9	77.48		81	
330	140	Jan 5	Jan 5	—	—	84		Planted immediately Jany — Also thickness of Glass.
332		Jan 5	Jan 6	50.10	—	86		
184	145	Jan 6	Jan 10	184.20	1	95		
337		Jan 7	Jan 9	88.15	—	10		Jan Inside Glass Cracked

No. of Sample	Number of Heating Hours	Date put in Oil	Date Taken	Time	Temp.	Rise	Rate
357	130	June 8	June 9	9:40	68	10°	Glass Cracked on Ending
362	172	June 8	June 9	11:00		17	Glass Cracked on Ending
368	147	June 8	June 10	9:40		10°	
361		June 9	June 10	9:40		10°	
371		June 9	June 9	8:40		11°	Carbon tube came down Cracked in glass

Remarks

No. of Book	Date of Planting	Date of Germination	No. of Days	Date of Bloom	Height of Stem	No. of Days to Bloom	Remarks
876		June 9	June 16	58.33		114	One of the Experiments
Notes	Seed on top						
325	140	June 9	June 9	11 00	7	124	
894	105	June 9	June 12	4.00		189	Glenco Planted
877	129	June 13	June 13	8.00		130	
400	124	June 14	June 14	4.00		151	



No of Lamp	Reg Applied for	Date Paid	Date Issued	Trade Name	Total Hours	Remarks
401	118	Jan 14	Jan 16	8.20	132	
						after two tests in week 74
137	133	Jan 2	Jan 30	8.45	1	
223	140	Jan 2	Jan 17	8.47	8	
105	141	Jan 2	Jan 25	4.45	21	
153	132	Jan 2	Jan 7	4.46	28	

No. of Lumber	Page of Lumber Book	Date Received	Date Sawed	Name of Purchaser	Number of Feet	Price per M.	Price per Piece	
224	109	June 2	June 29		134.30		25	Glass Butte Lumber Co.
181	132	June 2	June 27		4189		31	Carlon & Hicks et al Crump Lake
contract								
207	242	June 8	June 27		556		22½	and 35
	transf.							
878		June 2	June 26		2304	1	00	Carlon & Hicks
184	145	June 6	June 17		9468	7	50	Carlon & Hicks

No. of Journ.	Date when Received	Date when Sent	Date when Printed	Total Issue	Price per Sheet	Page	
973	123	Jan 9	Jan 24	162	1/- 7	65	Carbon Books
33-3	133	Jan 5	Jan 29	429		79	
313	114	Jan 10	Jan 30	175		81	
295	141½	Jan 12	Jan 29	171		89	
155	126	Jan 2	Jan 28	562	1	59	

No. of Lamb	No. of Fleece	Date when born	Date when Weighed	Weight	Tare	Net Weight
960	123	Jan 10	Jan 26	260	7	99
431	130	Jan 17	Jan 29	182	10	109
432	132	Jan 10	Jan 26	183	13	113
410	117	Jan 17	Jan 29	198		14
435	130	Jan 20	Jan 29	8	7	120

Ewalle Comm Co.

Ledger Page	Received	Date Invoiced	Date Paid	Amount	Per Cent	Page	
437	132	Jan 20	Jan 20	7.40		123	Sleeper in pulpit
436	129	Jan 18	Jan 20	2.00		127	
407	132	Jan 20	Jan 20	4.00		131	Bonnell Custom
438	135	Jan 20	Jan 20	2.00	3	133	Bonnell
443	142	Jan 20	Jan 20	.25	5	134	"

50

Ch. B Book	Rec. the leading Market town	Market	Rec'd	Rec'd	Rec'd	Rec'd	
444	138	Jan 20	Jan 20	23			

563 Inic Omelette Off at the Dolder ~~typo stamp used~~
Hung up by organ on omies on Feb 1. 11. 31- Rec 164-

572 Rec 350 Ornamentary tube 7/ leading omies Edison and Bust Ext. fixture

57

52

53

Cloth & stamp

Fish. Salmon

Black. other par. Hip

Black. Habit. Hunt.

Tobacco stone

Fish. Pa. Newspa.

Pork.

54

Plan 1

55

67
67
469
402
4489

85
85
425
680
7225

71
5041

81
6561

4489 | 7225 | 1.6
4489
27360
26934
4260

18.9
1.6
1134
189
30.24

30.24 Candles

5041 | 6561 | 1.3
5041
15200
15123
77

18.9
1.3
567
189
2457

56

100
28.5
715

511 | 6.3
486 | 2
250 | 12.6
243
70

30 70
900 | 154
4900 | 2
4500 | 10.5
4000
3600
4000

57

100
27.6
724

20.6
794

76176 | 524 | 69
456 | 8
138 | 524176

42436

63.0436

42 | 63.0 | 1
42
210
210

Let x = one distance
100 − x = other

$x^2 = \frac{3}{2}(100 - x)^2$

$= \frac{3}{2}(10000 - 200x + x^2)$

$= 15000 - 300x + \frac{3}{2}x^2$

$\frac{1}{2}x^2 + 600x = 30000$

$x^2 + 1200x + 90000 = 120000$

$x + 300 = \sqrt{120000}$

$X^2 = \frac{3}{2}(100 - x)^2$

$2x^2 = 3(10000 - 200x + x^2)$

$= 30000 - 600x + 3x^2$

$x^2 - 600x = -30000$

$x^2 - (\ ) + 90000 = 60000$

$x - 300 = \pm\sqrt{60000}$

$x = 300 \pm \sqrt{60000}$

$x = 600$

544

100
244
756

3600
1600

244
756

344
456

5·95536) 3·71536

$x^2 : (100 - x)^2 :: 1\frac{1}{2} : 1$

$= 3 : 2$

$x^2 = \frac{3}{2}(100 - x)^2$

$2x^2 = 3(10000 - 200x + x^2)$

$x^2 - 600x = -30000$

2079) 29·5936 (14
2079
8800

60

$10000 - 200x + x^2$

$x^2 = 2(100 - x)^2$

$x^2 = 20000 - 400x + 2x^2$

$x^2 - 400x = -20000$

$x^2 - 400x + 40000 = 20000$

$x - 200 = \pm 141$

$x = 341$ 59

$100 - x = 65.9$

$1162\overline{)40251}\,(41$

$1681\overline{)34481}\,($

$2X2 \quad 59$
$\quad\quad 41$

61

$x^2 = 3(100 - x)$

$x^2 = 30000 - 600x + 3x^2$

$2x^2 - 600x = -20000$

$x^2 - 300x = -10000$

$x^2 - (\,) + 150^2 = 22500 - 10000 = 7500$

$x - 150 = \pm\sqrt{7500} = \pm 86$

$x = 150 - 86 = 64$

$100 - x = 36$ 64

$1296\overline{)40960}\,(3$
$\quad 40888$

$3X2 \quad 64$
$\quad\quad 36$

62

$x^2 = \frac{5}{2}(100 - x)^2$

$2x^2 = 50000 - 1000x + 5x^2$

$3x^2 - 1000x = -50000$

$x^2 - 333x = -16666$

$x^2 - (\ ) + \left(\frac{1666}{6}\right)^2 = 27556 - 16666$

$= 10890$

$x - 1666 = \pm 104.8$

$x = 1666 - 104.8 = 61.8$

$\frac{1}{2} \times 2$ 61.8

38.2

63

729) 5329 (73

5096

2330

14.6 candles

27

~~729~~ 3 ~~3969~~ 5

~~729~~

3645

3240

729) 5329

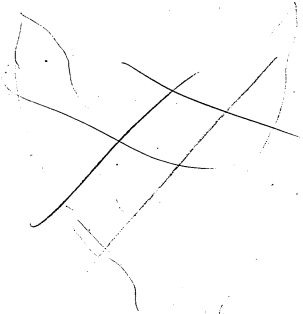
14.6 candles

64

207
793 428) 6288 (12
428
1008

24 candles

65



24 candles

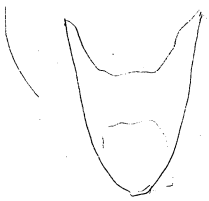
66

38.2 1459

618 3819

1459 | 3819 | 2.7
2818
10010
10213

5.2 Candles



5.2 candles

67

$x^2 = 8(100 - x)^2$

$x^2 = 80000 - 1600x + 8x^2$

$7x^2 - 1600x = -80000$

$x^2 - (\ ) + (228.5)^2 = -11428 + 52200$

52441
51984
11425
407.72

$x - 228.5 = -201.8$

$x = 26.7$

$100 - x = 73.3$

68

367
633

1346 | 3

candles

Electric Light 69

297 882
708 4942

882 | 4942 | 5.6
4410
5320

11 Candles
Flat side

393 1544
607 3684

1544 | 3684 | 2.3
3088
5960
4632
13280

4.6 Candles
Side

305 925 00
695 483025

925) 4830 (5.2
4615
2150

10.4 Candles

---

30 900
70 4900

900) 4900 (
544

10.88.

20 400
80 6400

16 candles

19.5 380.25
80.5

Placed candles in box of galvanometer

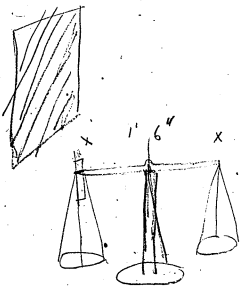
28.8
71.2

288
288
2304
2304
576
82944

71.2
71.2
142
71.2
5694
506944

829 | 506944 | 6.8
43 74
725 0
13.6 Candles
10 16
2.4 candles

Difference due to [illegible]

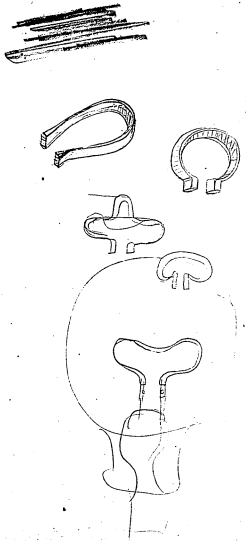


Howe 4 boards
30"X30"

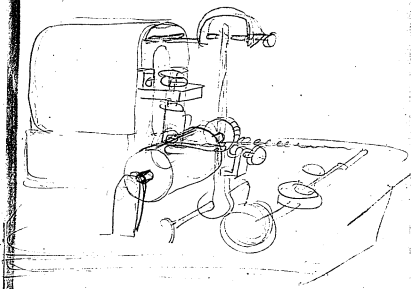
Two blackened on one side
Two [illegible] on both sides
with lampi black and alcohol
and just enough shellac
to make it stick and
give a dead black

74 Surface

75



March 07880



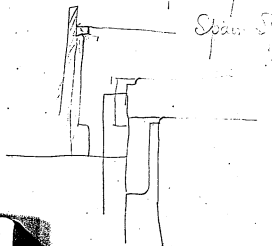
78

Spain Spain,

Spain

Spain Spain Spain

Spain Spain



75

1,3 m. rode
3.62
8
39
8 15.72
62
4.68 sq. in surface
cu in
~~Cu~~ 11 3/5 for capacity (small)
2 7/8 in apart

Final Experiment
two plates wt. 10 ~~grams~~ grams
each. in solution molecularity
strong for 20 hours
after standing 24 hours wt taken
Weight Rec. Carbon Pole
Wt 5 125 grams
Pt Pole 13 15 grams
19 12 loss 3 grams
Silver Wt
grams
diff. 8 2.5 grams
~~grams~~ 8 2.5 grams in 20 hours
2 7/8" apart
1 1/4" width
3 5/8 Deep
2 7/8 X 1 2/8 X 3 5/8 cub contents
inside jar

86

Cont. contents large jar

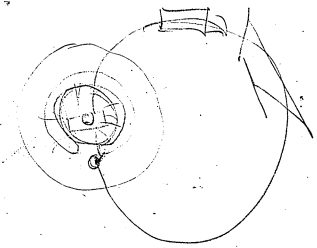
Dr 1 4/8

Length = 3 7/8

Depth 4 7/8

Cap 1 4/8 × 3 7/8 × 4 7/8 = ~~28 1/5~~

28 1/5 centimeter cubes capacity large jar inside



Small Pails H 9

3/4 in side in diameter

3/4 × 3 5/8 in surface

Both measure the same width

2680 sq. mm

Large Pail P.M. 10.50 May 19 1880

1 3/8 × 4 1/8 = X

1 3/8 × 4 1/8

11/8 × 33/8 = 363/8

33
33

64 | 363 (5 — 5.39 in surface
320
43
44

5/8 Large pails

Wed May 19 10 P.M.

Large two small pails

small pail 1-

88

Smoke Jar — Bottle

Smoke Plate 45.9 gr.

45.9 Poo. 16.5 grains

45.7 leg 75.4 gr

91.6 91.7

Dif .1 grain

Large 185.2 gr.

185.2 grains grand

94.1 " crop per

65.7 grains right afterwards

217.4

28.3 1

188.2

29.2

Dif

89

Filtrated plate from fine paper

Smoke Plate 30.2 grains in 12 hours

Long Plate 29.2 grains in 12 hours

30.2

$\frac{24}{37} = \frac{14}{17}$

1 Faber pen. m. = 19.56 grains

302

217.3 grains in 12 hours grains

$\frac{372}{442}$ 19.56 $\frac{12}{60}$ $\frac{720}{}$

117 3.60 Dri grand

$\frac{372}{4}$ .0195 6 grains 720

$\frac{324}{424} = \frac{162}{2012}$ 34 5181 14.08328

7201 15.43

38120 422496

136812 5633328

14.08832 0 97040 60

140832

2163837.76

90

217.3

Grammo depeso di
Total lunga
grammo di re depeso.
Dalla / Valore fatto
12 / Bonno

30.2 . 12. 217.3

30
30.2
217.3
217 | 30,00 (0,13824
217
830
651
1790
1736
540
434
1060
868
192

217.3 grammo per [illegible]
corrisponde corrispondente gr. / Valore per
Numero gr.
30.2 : 217.3 :: 1 : x

30

30.2 / 217.3 = / Valore

217
1

217.3		13824
1456		217
1303		96768
1086		13824
217		2764800
217		3099878
		106

30,2 | 4280,3500 | 13824
302
1190
906
2843
2718
1258
906
1528
1208
320
302
18

92

Thick cuffs for Lenge

Leg 38 12 grains

2

76 24

2 | 74 grain . 11.50

37 . 5.75

37 5.75 Art- carved

Pants for Lenge

Jim Fifth scene

93

small plates for

Oh Jan

(M-81 . 7 grams zinc plate

gram

10 . 7 gr centum

2 | 31.0 7.0

15.5 3.5

gr 7

15. 10,5

126

127

Experimental Lamps

1, 6.00

Broke at 2.45

" 5.00

" 1.45

7.45

Peculiar break and former between clamps fibre lying in bottom of glass

No 591 Rec. 3.50
on base Battleaxe double double
Commercial Brewery Co Ltd
Auburn Victoria
Pumpkin clamps

Double recessed in centre,
single faced clamps Steadfast
and Gosbel and Adams

Commenced Feb 4 1950
Brewery A/c 6.0 PM.

1097 Brick 5 C Nuts

Regular keak arch formed
between clamps fire in Hatton

Menlo Park Notebook #85 [N-79-08-22]

This notebook covers the period August-November 1879. Most of the entries are by Francis Upton and Francis Jehl. There are also entries by Charles Batchelor and Samuel D. Mott. Included are notes, calculations, and drawings relating to experiments with metal filaments, carbon filaments, and vacuum pumps. The label on the front cover is marked "Tests of Spirals and pumps Aug. 23 '79" and "F R Upton." The book contains 282 numbered pages.

Blank pages not filmed: 82-83, 232-233, 246-249, 272, 275.

Missing page numbers: 265-266, 269-270, 273-274.

No 85
XE-327

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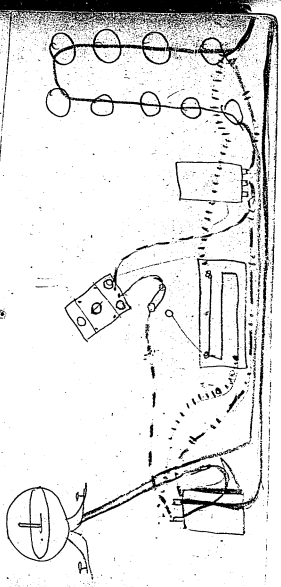
120 Broadway, New York.

Presented by
Wm. A. Simonds.
Sept, 1896.



Aug 22 1879

A spirals of .005 in. in diameter was wire wound closely on and sealed into a globe of glass. The wire ~~attached~~ by which the current was conducted through the glass was ~~made~~ platinum. The spirals was then placed in the bridge made as drawn on page 1

The glass around the Pt. wire ~~cracked~~ was enough to admit the vacuum

3.14	1.5
1.5	1.5

3.14	0.4969
1.5	0.1761
1.5	0.1761
44.3	1.6464
	2.4955

313 Reddish yellow

A spiral in a low vaccumm having a resistance of reddish yellow. Consumes with current of 1.5 Webers

313 foot lbs. required per minute

9

33.000 45,185
297 2.4733
2.0452
.0334
2.0118

1 H.P.
102 per H.P.

4.95 0.6946
3.65 9.4377
.1323
.0334
.1657

1.35 Webers
1.46 Webers

The experiment was continued after with the same no. of Webers the spiral rose to a bright yellow.

Around a resistance of 3.65 Ohm a deflection

$\frac{198}{200} \times 5.$

3.65 Ohm $\frac{.99}{4.95}$

.99
4.95
Comp 3.65
4.95
44.3

0.6946
9.4377
0.6946
1.6464

2.4733
.0334
2.5067

~~297~~ 322

8

322 2.5067
44.3 1.6464
1.8603
4301

2.7 cells of carbon

9

~~3.65~~

4.9.5

Amount 3.05 ~~Cold~~ Hot

Spiral ~~cold~~ hot 3.05 Ohms
cold 1.95 Ohms

Spiral 6 inches .007 in. 20 to 14.7

3.14
.007
.02198
6
.13188

13/100 in surface

13) 100 (7.6
91
90

8 Coupons an inch

Conducting wires 11 Ohms

Resumé Experiment No. 1

A spiral of wire made of 20% Pt. 9 n. alloy, .007 in. diameter and six inches long was sealed into a glass bulb.

The resistance of the spiral cold was 1.95 Ohms

just red to black	3.105 − 11 =	2.94
reddish yellow	3.14 − 11 =	3.01
bright yellow	3.65 − 11 =	3.54
whitish yellow	3.78 − 11 =	3.67

Remarks The current was passed through the two galv. but it was found that the measurements were not to be relied upon as the induction coil was too near the gal.

2 1.198
.199
5
4.95 0.6946
44.3 1.6464
4.95 6.6946
Comp 3.54 9.4510
1.08 .0334
1.08 .0334
2.5534

4.5185
2.5534
.9651

92
.13
276
92
11.96

356

Assuming the area of the bridge containing the large wire the high resistance galvanometer was placed and the deflection from compared with that from five cells of standard Daniells.

In the case measured

$\left(\frac{1.98}{200} \times 5\right)^2 \times 3.54 \times 443 =$

the no. of ft. lbs. of energy consumed 356 per minute or $\frac{1}{92}$ of a horse power that is 92 spirals having each .13 in. radiating surface could be kept at a bright yellow by one horse power. or 11.96 inches of radiating surface

~~Where the~~ This result was obtained in a vacuum good enough so that the phosphorescent light made its way into the bulb from the iron terminals of the gauging tube

When the air was let into the spiral was bully red and after the glass had cooled it was black.

32) 5.0 (.156
32
180
160
200

.156 1. 1931
.471 1.6730
2.8661

.073 1339

1/13

314
15
1570
314
.4710

Aug. 24. 1879

Spiral No. 2

A spiral wound very closely and kept in a vacuum over night. (without heating) The wire .007 in. in diam six inches long covered with Corundum. The spiral was placed thus spiral .15 in diam

3/32 long

13 to an inch

The vacuum was good enough to stop a half inch spark. When the current passed the sparks again appeared and the spiral was dull red.

200 | .85

.425

5

2.125 .3273

-1.08 .0334

.3607

comp 2.94 9.5317

log 44.3 1.6464

1.5388

.3607

3½ 1.8995

79 ft. lbs

This shows the air escaping from the Pt. after the vacuum became perfect again the spiral was brightened.

$\frac{85}{200}$ X 5 Daniells over

3.05

11

2.94 ohms

79 ft. lbs.

A carbon cell put on this spirals and nearly the same value obtained

1125
.7625
5
3.125 .4949
1.08 .0334
.5283
.5283
comp 3.19 9.4962
44.3 1.6464
2.1992

158 ft. lbs

after an hour
brought up to reddish yellow

$\frac{125}{200} \times 5$ over $\frac{330}{3.19}$ $\frac{11}{}$ Ohms

158 ft. lbs.

White

$\frac{263}{200} \times 5$ over $\frac{382}{3.71}$ $\frac{11}{}$ Ohms

1.315
5
6.575 .8179
1.08 .0334
.8513
.8513
comp 3.71 9.
44.3 1.6464

.8513
.8513
9.4306
1.6464
2.7796

602 ft. lbs.

4.15 × 404 = 6,81 × .6021 = .01160

2.9989 / 160 = 9.0149

1035 ft lbs

602 ft. lbs required to bring the spiral to incandescence

330 / 55

About a candle, with less

35.8 / 200 × 5

4.15 Lamps
11
4.04

2 (35.8)
1.79 — .2529
1.08 — .0334
.2863
.2863
comp 4.15 — 9.3820
44.3 — 1.6464
1.6010
25 — 1.3979
2.9989 per candle

Correction 1035 / 1036 ft lbs.

33 candles per H.P.

224

Deflection on magnet 18° 30'

1.04
1.04
864
1.04
1.16 LY

8.625 .9357
8.625 .9357
1.116 .0668
Comp. 3.74 9.4271
44.3 1.6464
3.0117

1027

2

In this spiral with the same current in the air gave much less light

In open air no change in the resistance

345/200 X 5

1725/5

3.85
11
3.74

8.625 .9332
8.625 .9332
1.116 .0666
Comp. 3.85 9.4145
44.3 1.6464
2.9939

1027 ft. lbs.

about 1/4 the light

824

Astral

27

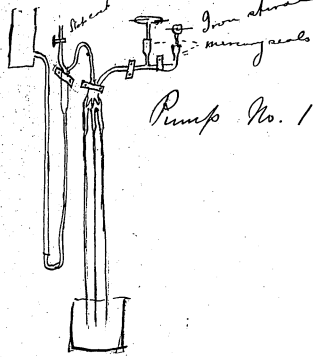
A steel ^ye of your what
A steel ^ was afterwards
brought to as to give what
was estimated as eight
candles by means of a tallow
dono measurement. Four
hours taken in bringing it
to white heat ——. This steel
taken to Saratoga.

Sept. 8, 1879. 29

The ~~induction~~ large induction coil was brought in order. The condenser was crossed and so that it had to be removed. On putting on the whole of a W. U. condenser 1.6 M.F. ~~there~~ a spark 3/4 in long only could be obtained.

Thinking the trouble might be in the coil we ~~examined~~ ~~it~~ ~~and found a break in it~~ cut off the covering and found all good. On putting back the wires a good spark was obtained with less condenser. 3 inches spark with six plating cells.

The three fall pump arranged thus



Pump No. 1

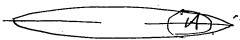
A .015 in. iron wire, was
fastened to
and a .020 in. Pt. wire and
sealed into a glass bulb
Difficulties met with.

Vacuum broke the cracked
piece of dirt in one of the
small jets preventing the Hg
from flowing out from
it so that as the other two
exhausted the air could enter
through the tube which had
little Hg. in it. The dirt
washed partly away and
heating the tube very hot
done enough away to the
sufficient Hg. fell to seal the
tube.

About 11-30 a good vacuum obtained. The tapping of Hg into the mercury seals seemed to help very much. A piece of dirt got into the middle tube and stopped its working.

Phenomena noticed. When at a blue stage the color relays could be made to appear on heating. The lower part containing Hg. was strongly heated so that the pumps was well filled with Hg. vapor. The aluminum electrode became bright yellow in the blue light with some green phosphorescence. At one time the yellow electrode could be made to change places by heating in the tube. It would jump over and

then dance as if uncertain where to stay after the flame was taken away.

B  A

A a blue light. Next and B grows smaller. Red end A larger.

Large coil started without any connection with induction terminals. Blue phosphorescence seen faintly. One of the terminals connected and the whole tube filled. Both terminals connected phosphorescence small, but electrodes yellow.

Sept. 9, 1879. 39

Iron spirals .015 in. wire

11-55 a.m.

½ Weber 6°

12-10 m. 12°

1 Weber the current had been taken off and put on suddenly several times increasing it in strength gradually.

12-55 21°

1-35 P.M. 26° red

1-50 P.M. 27° 30′ yellow

red in the middle of the outside seemed cold. The spirals came up extremely slowly.

2-05 yellow red

2-20 stopped

2-35 Started 28°

using the Faradic machine

2-45 29° 30' yellow

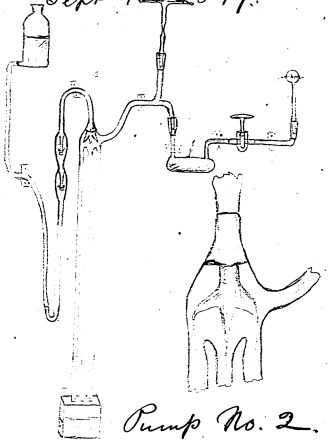
3 P.M 31°

3-25 P.M 35° Globe darkened

The chimal was then brought to a white, and the globe was found covered with a very dense deposit, and bright metallic lustre with fern like spots in it. It was extremely opaque. Dr. Haight tested it and found iron.

In trying to take the piece of glass out of the pump it was wholly broken. Bishop began to put the new pumps together. He worked all night and in the morning the tools were ready

Sept 10 1879.



Pump No. 2.

Sept 10 1879

Commenced 12-30 PM
The three tubes working well, joints sealed with Hg. Sulphuric acid in the Sprengel tube.

Fault

Should be

At 7-30 P.M. a vacuum was obtained good enough to stop the shock from the small coil.

The vacuum was lost in carrying the pump. Most trouble was met with in starting as the Hg did not flow from one of the drops. It was needful to allow one of the tubes to remain open so that no vacuum could be procured. That tube was sealed by placing a tube with Hg at the bottom, which was allowed to remain until the Hg fell from all three of the tubes.

10 P. M. Pump working well globe on it from lamps, all connected. Lamp a small double spiral regular model.

11. P. M. Blue evening stretching back ½ inch

12 midnight the pump broke. The rubber tube had swollen very much larger and the weight of

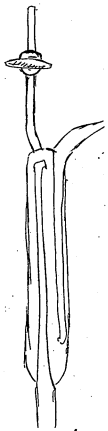
the Hg in bake the pump ~~jistabration~~ at the top of the ~~fountain~~ ~~on~~ upper air catcher.

Sept. 11 1879.

In the morning The pump was fixed again tried to get a vacuum but did not succeed Purged the Hg again & tried it again. commenced at about half past twelve. did not get any good results during the afternoon. the Hg would collect & fill up the fall tubes the Hg could not get through. That portion

of the pump where the
cloth covering was
which seem to be
covered with the oxide
and other impurities
at about four o'clock
the vacuum was very
poor, exhausted but
a little more to come

worked on it until
about twelve o'clock
but did not get
a vacuum. ~~at twelve~~
~~o'clock~~.



New Chamber

Sept 12 1879

The pumps was fixed in the morning, a new chamber was put in instead of the old one
new one old one
which gave very good results, we commenced at half past ten velocity a lamp made by Mr Bastian covered with (1/4)" of wick, made of Aluminium and Dextrine, and trimmed in two layers one time. got a vacuum so that the 1/8 inch spark coil, would not give any light at one velocity one then put on the

large coil and got a kind of red illumination, a half an hour afterwards we got a white kind of light we put one cell of the chromic battery on the bobbin at about half past one o'clock, with two ohms resistance in the circuit. it turns black (bobbin) owning to the organic matter (Dextrine) which was mixed the the aluminum.

at about two o'clock we got a bright white light, one of the electrodes took a yellow light on it.

at two yelwest & put a half an ohm out of the circuit.

At two minutes past two Mr Bachlor cutt out an other half an ohm. At twenty minutes of three Mr Bachlor put out an half an ohm. This make one cell carbon on the lamp and half an ohm at ten minutes to three we put two cell on with two ohms resistance, it just heated it up to a very dark red. There was a little change in the light, the yellow was fainter and a very light green spot.

was observed mean the yellow. At 3·20 pm we made Resistance ½ ohm less. This it was:—

			Remarks
1½ pm.	1 cell	2 ohm res.	Blackness spoil.
2 pm	1	1½ "	
2·10	1	1 "	
2·40	1	½ "	
2·50	2	2 "	very dark red
3·20	2	1½ "	Darkness but little brighter

{Vacuum has not altered during last hour} {owing to gas coming out of spool}

3.35	— 2 —	1 ohm.	
4·	— 3 —	2 ohm – red –	
5·50	— 4 —	2 ohm yellow	
5·55	4 —	1 ohm "	white

Some visitors came in the afternoon (Mr Bankor + others) and the spool was brought up with seven cells then it burst, owing at the Time about 4 Candles.

At eight velocet P.M. we put the pumps again in operation, a new spool was put in $(1/8)^2$ of an inch. covered with Aluminoid & Dorlonine.

At quarter past nine we put one cell on the spool

~~9.15 P.M. 1 cell. Resistance.~~

9.15 P.M.	1 cell	3 ohms Res	Remarks. Blackened it
9.45 ...	1 ..	2 ...	
10.10	1 ..	1	
10.15.	2 ..	1	
10.30	2 ...	0	cross. showed red only.
11 ...	3	2	the spool began to get red! Dull
11.20	3.	1	Red, goes down + up owning to the cross
12	cross pressure kept from going any further the spool away		

64

65

Put in a new spool at about eleven oclock + commenced a vacuum stop the pump at dinner sealed it at the bottom with Hg commenced 3/4 of an hour afterward again, vacuum no good. stopped pump,

~~Commenced again at four oclock~~ got a pretty good vacuum at 6 oclock,

7 1/2 V 2 cells 3 ohms Removed Right Rod
8 " 1 " " 2 " Rod in the middle cord on the ends

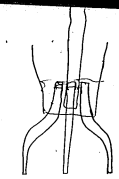
Mr Edison ~~bought~~ put on cleos after this until it busted (7 cells.)

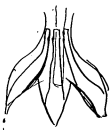
Sept 14 1879 67

Commenced in the morning on the tube of the pump put one of those pure rubber tubes in the large rubber tube, Did not not get it working, change it again, got it working. Commenced on the vacuum at 12.15 lost it on Taking off a stop cock at 12.45 Commenced on vacuum at 12.50. Got a good vacuum after this.

7.45	2 cells	3 others very little	Removed
8.	2	Redrin the middle one with the	

Mr Edison added cell after this until it bursted (7 cells)





A new spool was put in at twenty minutes past nine, and we commenced the vacuum. At twenty minutes past ten the pump bursted (being heated to much on of the fall tubes broke.

Sept. 15 1869.

Pump repaired in the forenoon. Put in operation at one p.m. perfect vacuum at half past two p.m. Commencing of heating the lamp about at half past three.

At half past four o'clock the spool was busted by the large inductivis coil one wire being on the gauge and the other free

This was the third one 71
buried in this way
At five fourty we commenced
again on a vacumm, the
lamp on which the spool was
was creack it was covered
over by sealing wax.
it was no good we cut the
lamp out, and got a vacumm
at about ten oclock
Sept 16
We commenced at halff past
eleven to put the pump in
operation with a new spool
in. Did not get her going

Sept 17 1879

Got a good Oneal Batchelor vacuum at about one o'clock A.M. The spool was brought up one of the leading wires gave away, so we stop.

Commenced again at half past twelve, with a new spool.

A.M. At			Remarks
2.	1 Cell	3 Ohms	
2.15	1 "	2 "	
2.45	1 "	1 "	
3.10	1 "	0 "	
3.25	2 "	3 "	Little Red
3:40	2 "	2 "	more Red
4	2 "	1 "	Red
4.10	3 "	3	"
4:35	3 "	2	
4.50	3 "	1	

P.M. 5.	3.	clear		Rain 7.30
5.30	4	3		bright red
5.50	4	2		white

Thursday 23 Sept. 1897

Put in a new spirals at 6.P.M.

	cells	R	
6.	1	2 1/2	
6.50	1	2.4	
7	1	2.3	
7.20	1	2.2.	
7.40	1	2.1	
7.50	1	2.1	
8	1	2.	
8.10	1	1.5	
8.30	1	1	
8.40	1	.5	Little Red
9.	2	1.	Red

Kept it at this point till half past one (1) o'clock.

Commenced again at eight o'clock in the morning (Sept 24)

	cells	R	
8.	2	1	Red
10.40	2	.6	
10.50	2	.5	
11.	2	.4	
11.10	2	.3	
11.20	3	.6	White
11.30	3	.5	
11.40	3	.3	
11.50	3	.0	

Sunday Sept 23 1877

Shot Catcher

Commenced at about half past five, got a vacuum at about six put a current on the spiral at 6½

	cell	Deg
6	1	4°
6.20	1	6°
6 40	1	6½

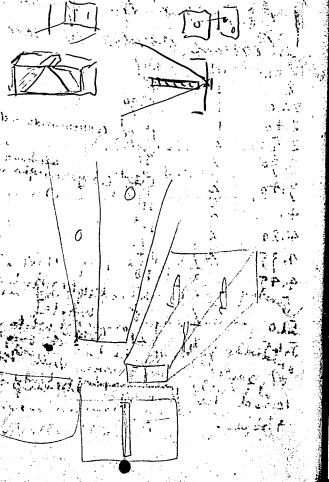
broke the lamp as Mr Edison put 7 cell on it and busted it.

Commenced again at eight vacuum at about nine put current on it at 9.20

	cell	Deg	
9.20	1	4°	
9.35	1	6	
9.50	1	7½	
10.00	1	8	Dull Red
10.20		10½	
10.35		12½	Red
10.50		14°	Bright Red
11.20		18	

11.40	3.	19		
11.55	3	21	bright. White	
12.20	3	24		
12.45	4	26½		
1.10	4	29		
1.50	4	36	forced on the account of Hg timing in the leads.	
2.10				

84



85

Sept 25 1879

Glass covered wall
Cabinet Ox in 0006 P. Ir. 207 [illegible] all
[illegible] Expanded Type apparatus (1).
[illegible] Erbium oxide (2) Aluminum

Bath Temp.	Time	Cell	Ref.	
	2	1	4°	
	2.20	1	5.30'	
	2.40	1		
	2.50	2	6.30'	Cerium oxide w dull Red
	3.30	2	9.	Aluminum dull RED
	3.45	2	9.45	C.O. Yellow-red
	4.	2	11.	
	4.20	2	13.	
	4.35	2	14.	
	4.45	3	16	
	5.20	3	18	Wh. red
	5.45	3	21	bright white Dull

[illegible] gentleman came [illegible] Edison
and he brought [illegible]
[illegible]

The L+D. Coating ... powder a ... find that ... is browned ... to ... to L+D oxide

Mercury in globe ... blocks ... glass ... glass clear ... Hg =

Lime melts perfectly to a ... green ... phosphorescent ... glass ... Cerium ... also most of ... the ... as ... as lime ... & far better than Cerium ... aluminum

Exhausted two spirals again at 7.30. Covered one (1) LANTHANIUM & Didymium oxides .006. another with Cerium oxide .006

	CELL		
7.35	1	7.30	
8.50	1	5.	
9.	1	6.	Gbl. t.
9.15	1	7.	
9.30	1	8.	Dull RED st.
9.45	1	9.	Red
9.55	2	12.	Red

Mr Edison brought them up then the cerium oxide busted the Lanthanium & Didymium ... but ... (7.4.) ... the words of the lamp ... that of the 7 ... went off ...

Yours truly
Jno T. ...

with an Aluminum [illegible]
Cerium the Cerium [illegible]
incandescent white the [illegible]
Lime was only yellow [illegible]
although the Aluminum [illegible]
brilliant was brilliant [illegible]
than the Cerium —

With Lanthanum & Didymium
[illegible] one of Lime. The former
was brilliant incandescent
white the Lime was yellow
[illegible]

[illegible] Lime [illegible]

September 26 1877

Charles Reed two lamp at one time. One was covered with Lime .006 and the other was Lanthanum and Didymium .006
He got in the globes.

Time	Batteries	Dep	Remarks
9.30	1	3.30	
9.50	1	7.	
10.5	1	5.	
10.20	2	7.	Dep Lan. giving red
10.35	2	7.	Dep the is yellow Red while the lime is pretty Red
10.45	2	9.	
10.55	2	11.	brought them up Then

Put two Limes one on this .006

12.30	Batteries	Dep	
1.	1	5.	
1.15	1	5.	
1.25	1	7.5	
1.37	1	8	
1.45	1	10.	Yellow Red
2.	2	11.	Red
2.15	2	12	
2.40	2	14	

over

90

The of the thine I was headed up more than the other, or there
perhaps due to having less
coaling than the other, I
brought them up very high
[illegible] of good light

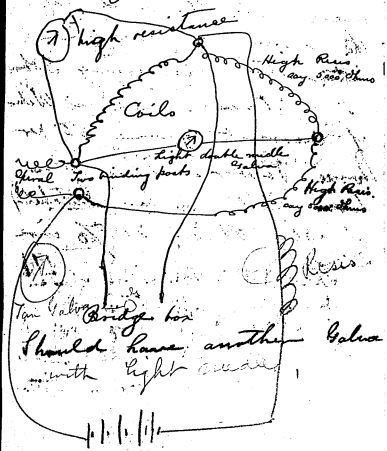
91

Time	Lane	Alt	
2.55		4	16° bright Red
3		4	17
[illegible]		4	[illegible]
1.30		5	20 White
4		6	28.30 bright White
			Commenced again on Spitzes at 7.30
7.30		1	4
7.40		1	6
7.45		1½	8 Dull Red
7.50		2	9
[illegible]		2	11½ Red
[illegible]		3	12° Red
[illegible]		3	13°
10.30		3	15° White
10.45		4	16°
10.55		5	20°
11.05		6	22

Mr. Edison claims eight candles from this Spiral. George to read at the end of the week a rough estimate, assuming 2.2 Ohms as resistance and 12 Webers of Current gave 6.5 per Horse Power. This was from 1/2 inches (Bitchits) of .006 [illegible] 20 [illegible] There [illegible] millions in [illegible]

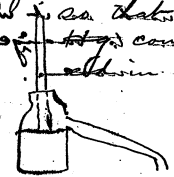
Oct. 1. 1879.

Shall put the Spirals in bridge



Should have another Galvo with light

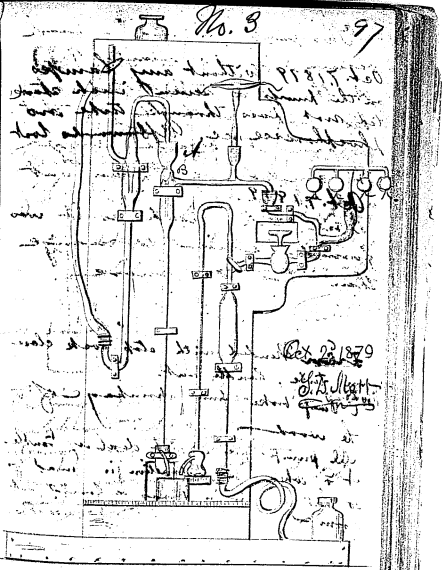
Changes in ~~pump~~ and two made
~~Glass~~ ~~tubing~~ with Greiner
~~Rubber~~ ~~Stopper~~
Cu. tube for absorbing Hg.
Mercury bottles at bottom
of all tubes this
so that the escaping
~~Hg~~ could be collected
~~again~~ ~~in~~ ~~the~~ ~~vessel~~



Putting more rubber in waste
rubber tubes.
Using one fall tube
Doing away with cloth
strainer.

96 This pump pumped in a second
recorded 20 minutes
A. The fall tube
that point with Hg
in case it became stopped
it could be
air channel.
B: The pump broke here.
given.

No. 3 97



98

Oct. 7, 1879 Without any Sprengel's on the pump a seven inch spark did not pass through tube, no phosphorescence. Afterwards tried

Oct. 7, 1879

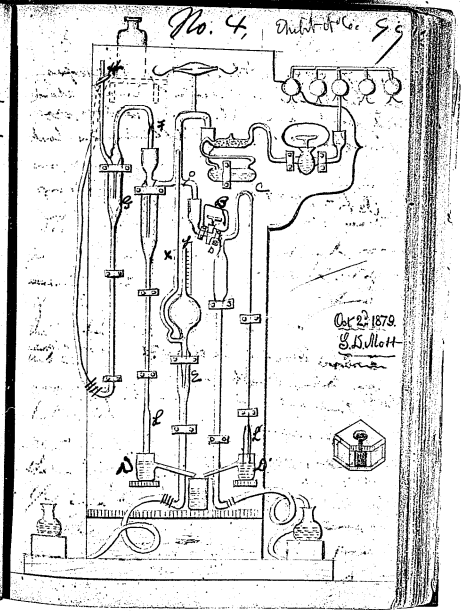
C. The pump broken here, Francis thought that there was a vacuum in the four tubes and put the stop. too quickly up.

D The pump taken off broken here Mended with stop cock close on tube, handle out.

Nov 29 Pump broke from shrinkage of the wood.

All pumps give a great deal of trouble at F where a contraction is made so that the air in B may be forced out from it

No. 4, Duplex Hg. 99



B This stop-cock placed too far from the main reservoir so that the tube near it caught air. This could be worked out by letting the Hg overlap work up and down.

The MacLeod should not be used until a high vacuum has been attained. For if this has not been done the Hg sticks in the side tube. Last evening a vacuum was obtained so that the spark jumped five inches outside of the tube rather than across 1/8 inch in vacuum.

The changes in vacuum were extremely rapid, from green to a small spark

in a few seconds and then in a few minutes to stopping the large spark. The finely divided copper and sulphuric acid may have had a strong influence on this.

7. The tube contracted here so that a pressure can be obtained by G to drive the air out through the stop cock H.

The enlargement of the tubes at d d' is a mistake as a bubble of air collects here and is drawn up into the pump. Making stop cock D with tube to left inclined upwards may be a mistake as the Hg collects -- take out cock and stop the hole.

Pure black rubber tube placed inside of white rubber to prevent boiling Hg.

Tried Iron Spiral

3-15 F .007 in. diameter

1 cell of Calland battery through 450hms outside

3-45 2.5 Ohm

4-15 1. Ohm

The vacuum becoming constantly better as shown by the MacLeod Gauge

4-40 MacLeod Gauge

105 — 59

5.00 P.M

105 54*

1 cell on Spiral dull red air probably

Coming out as the gauge showed ~~fresh~~

105	45	5-15
108	33	5-40
108	41	5-55
108	50	6-05

The pump was 7-30 PM
taken off at six and
the battery put through
the spiral alone, until at 7-30
~~exactly~~ as was no red-
ness could be seen.
The gauge then ~~drew~~
showed so great a change
that the surface of Hg was
in the globe below the 0
when that in the tube
was at 108

Mr. Edison proposes measureing the amount of air given off from a spiral by means of Mac Cleod guage. The exaustion should be once made and the pump stopped, then if the capacity of the guage and the pump be known the air given off may be calculated

110

Spiral covered with rust
time.

At 6 PM.			Rain
	6 15	1	4
	6 30	1	3½
1	6 50	1	3
1	7.15	1	2.5
	7.30	1	2
	7.50	1	1.5
		1	1. Bright Red Letter Day
Wagner 5 miles			9 over again it with one ecce,
	9	2	1.5
22 mile			
24	9.12	2	.8
	9.20	2	0
	9 30	3	.2
	9 50	4	.7
	10	4	.2 Rain at this Time

256.

1 - 6

4

16

44

64

64

704

352,

176 -
6

058

3½) 1584 (454 5
142
18
17½
1

3½) 45½ (1 :
35
44

33
6
198.

7) 451 (64
42
31
28 - 3

64
4
256

	cell	ohms
1.30	1	3
1.50	1	2.5
2	1	2
2.10	1	1.5
2.20	1	1
2.30	1	.5

If lamp has three ohms and remainder

Spiral covered with
~~from~~ zinc acetate
from the acetate
probably about one ohm

	cell	
1-30	1	3
1-5-0	1	2.5
2	1	2
2-10	1	1.5
2-20	1	1
2-30	1	.5
3	0	0

The MacLeod showed
the level at bottom of
tube from upper lead funnel.

mm Hg	cell	R
3.15	2	1.7
3.10	2	1.2
3.40	2	2
3.50	2	0

Goes off at about 2 candle (daylight judged) leaves wire perfectly true and very bright. showing that the Zn did not attack it at all.
Tinted the glass so that we got a reflection of the ~~shield~~.
Wire ~~exposed~~ 4 cells ~~heated~~

Two spirals
One Tatanic oxide, and the other quice from the oxide + water
Vague showed before. The current was on just at the beginning
at 5:20 1 cell 1 ohm
5 40 1 0
Vague showed at 5:50 20 mm
6. 2. 1.5
6.40 2 0.

showed just at the beginning
being due to the arc in the
spiral R.

T.	3 cells	I	Red
7.10	3	0	
7.15	4	.5	white heat
7.30	4	.0	

Gr. arc at 7.50 13 mm from 105 m.
= 95 mm.

δ . 4

The Zr. was bright
in the inside of the spiral
while the Titan. remained
well insulated
The Zr. oxide volat-
ilized but did not
melt.

The titanium brought up and gave ~~gr~~ five or six candles.

When the Jn. gave a bright white light the Titanium gave only a red. It may be that the latter does not give such good results.

3.5
3.5
18.5
10.5
12.3

Gas light 12 candles small jar Photometer made of paper and shot.

Leading wire of Titanium spiral melted 5 cells over .2 resistance. Glass not coated. Good Spiral.

MacCleod Gauge 125

Wt 102.512
100.154
2.358

Wt. in tube so that the top of meniscus came to mark

107.722
28.646

Wt. of Hg in figure 5 times 79.076

Taken 79.076
5

In double necked vessel 395.380

126

2.964
.176
3.140

127

12 less 148.700
13.105
135.595

63.213 wt Mg.
63.037
.176 mg to find mols
63.037
61.073
2.964

Oct. 8, 1879.

At this date the trouble is to get an insulation from the platinum wire. all the common oxides melt and volatilize at a far lower temperature than the Pt. after the process. Again many of the oxides become conductors at the temperature of incandescent Pt. All the known oxides are to be tried in various vacuums for it is thought that some one may answer the purpose or a hint be given as to a method of fusing the oxides, as Pt. has been prepared.

130

Oct. 5, 1879

131

Pump No. 4 was broken and is slightly changed and repaired.

The stop cock B is now close to the ~~to~~ main tube so that no air is held in side tubes. The to vessels D, D' were made longer so that the Hg. would not splatter over.

In starting the pump the Geissler worked well, but the Sprengel pump required a long time. The cleaned dumps, perhaps pumps moist from air in pumps it.

Spiral insulated with Silica.

In trying the pump it was found very difficult to get a vacuum. After several hours the air dried was heated so as to drive out the air in it and a good vacuum was obtained in

an hour. The Cu. [illegible] the SP4 were removed Oct. 10. The Cu. [illegible] [illegible] [illegible]

Probably [illegible] reading [illegible] Rowland says that he may not have fastened the Pt. well to the small tube in which it was fused. The glass around the wire was opaque with small cracks.

The lamps leak though no crack can be seen in them. The glass may be different.

Carbon stick

Put in arm of bridge and heated resistance decreased

Stick 8 inches, long .060 in diam

5°. 5 Ohms

Same stick heated by the current decreased its resistance. Red heat oxidized and increased.

Mr. Edison thinks that pure carbon would increase its resistance on heating. That the cause of ordinary carbon decreasing is that the fine particles make better contact with each other.

Trying to mould stick of .010 in diameter and to make them into filaments

136

137

Oct. 11 1879

Pumps, dumps dry. Three
3755 ohms 205-42 = 63 mm
4-15 105-54 = 61 m

Field Shunt in bridge
Warm 2.5 Ohms
Yellow 3 Ohms
3-55 Ohms

Oct. 13. 1879

Steller and still good light from both poles. N_2 in. Pumped the tumbler on and allowed to run very fast. Good vacuum to stop small sparks in an hour.

106 − 45 = 61 min.

~~Mt. Lambo Alton~~

.95 − .07 = .88 measured with dividers from bridge top

The air shut in the MacLeod gauge locked at E Pump No 4 page 99 at a high vacuum except into the pump and destroyed the vacuum this tube should not be closed until a good exhaustion has been obtained.

Spiral covered with Black X

.95 - .07 = .88 Ohms in Spiral measured cold from Bridge Box

Vacuum 1.05 - 5 2 0 = 5 3 1 1/2

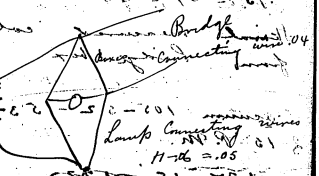
3-15 P.M.

1.28 - .11 = 1.17 Ohms

1.15 Ohms

In fridge .05 Ohms to be deducted when the E.M.F. is calculated

.01 to be added when the resistance of Spiral is measured



1.32 + .01 = 1.33

Spiral 1.33 Ohms

Spiral 1.31 Ohms measured current through it with conductors

1.31 − .09 = 1.22 without conductors

1.21 Ohms measured direct.

Take off .09 Ohm from resistance for conducting wire.

Take off .04 Ohm for E. M. F. for conducting wires

No perceptable deflection 5-40

5-45 P. M.

1.50 Ohms − .09 = 1.41 Ohms

Deflection

1.1 ~~Daniells~~ Volts

1.50 − .04 = 1.46 Ohms

$$\frac{1.1 \times 1.1}{1.46} \times 44.3$$

1.21	0.0828	
44.3	1.6467	
comp 1.46	9.8356	
	1.5648	
36.7		Black
33.000		4.5185
		1.5648
		3.9537

146

147

Red dark on sides

1.65 ohms

9

1.56 ohms

$$\frac{1.3 \times 1.3}{1.56} \times 443 = 481$$

687 per H.P.

Red 8 1509 gn.

all red

1.80

.04

1.76

$$\frac{1.8 \times 1.8}{1.76} \times 443 = 404$$

404 per H.P.

.3222
.3222
1.6464
9.7392
2.0307

4.5185
2.0307
2.4878

3979
3979
1.6464
9.7212
2.1654

4.5185
2.1654
2.3531

2.25 H.P.

Yellow red supporting wires red

1.78 Ohms

2.1 X 2.1 / 1.82 X 44.3

.307 for H.P

Yellow

2.5 X 2.5 / 44.3 = 1.4

H.P.

.51585
1.6464
9.16925
2.3759

4.51585
2.37597
2.14226

5798
5798
1.6464
9.16536

4.51585
2.45596
2.05989

.6435
.6435
1.6464
9.16478
2.5812

4.51585
2.58112
1.93473

3.3 X 3.3
2.03
44.3
1.99
33% for H.P.

3.8 X 3.8
2.22
44.3
2.27 - 5 Ohms
114 per H.P.

4.4 X 4.4
2.28
44.3
2.30 - 5
86.6 H.P.

3

49.
44.3
2.25

4.5185
3.8797
.8388

7482
7482
19.64464
9 6 1 6 2
2.75900

3.3979
.6464
9.63544
3.6791

4.5185
2.7590
1.7595

About a candle

50 X 50 = 2500
232 X .6467

2.37 - 5 = 2.32

69 per H.P.

247 - 5 = 242

8.6 X 5.6 = 44.3
2.42

238

58 per H.P.

Results of Oct. 13. 04

Rivals covered with silica so that there was a thick coating completely hiding the form of the wires. Dead White fluffy.

Commenced at 5 P.M very weak currents

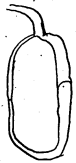
No. per H. P.	Color	Resistance
	Cold	1.22
6 P.M. 687	Red dark on edges	1.56
8-15 404	All red	1.71
8-40 307	Yellow red slipping wires not	1.78
225	Yellow	1.86
139		1.99
114		2.18
86		2.21
9-20 69	1 Candle about	2.28
58	Fair light 2 candles about	2.38

The stirrup broke off at 13.7 the leading wires. The stirrup was bright and seemed under the microscope to be covered with a bright glaze.

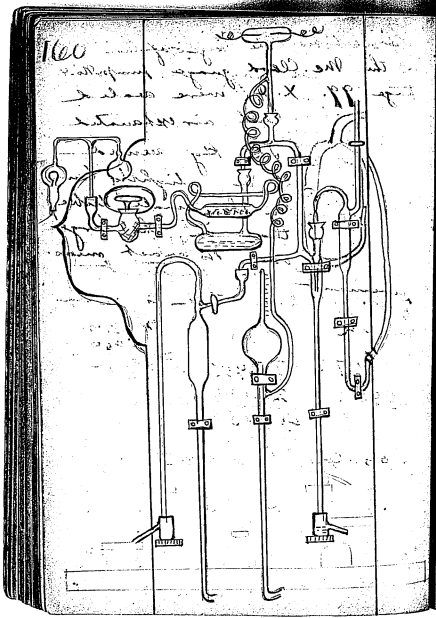
The stirrup ~~was~~ burnt with the same battery as was one for the last when after a few minutes of rest it was put on suddenly.

Oct 4, 1879

Two tubes the size of those 154 in the Mc. Cleod gauge pump No. 4 page 99. X.Y. were sealed and air exhausted.



The Hg seemed to be slightly lower in the small tube than in the large one. No exact measurement.



160

MacLeod Gauge 161

See page 125 - 127

Wt in bulb 395.380
in tube 3.140
Total 398.520

3.14 0.4968
395.38. 2.5970
3.8938

.0073 The constant of the whole tube to lower mark.

395.380
2.964
398.344

.176 · 7.2455
398.344 2.6003
4.6452

.00044 Constant

162

163

$$\frac{760}{10000000} = .000760$$

$$= .00076$$

Let x = pressure in guage
p = height Hg. in tube
V = volume bulb
v = " " tube

$$(V+v)x = (p+x)pv$$

$$Vx = pv$$

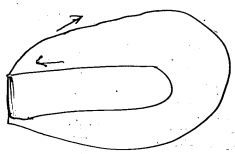
$$x = \frac{v}{V}p$$

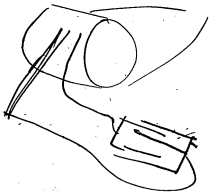
$x = .00076$ $\quad p = \frac{V}{v}x$

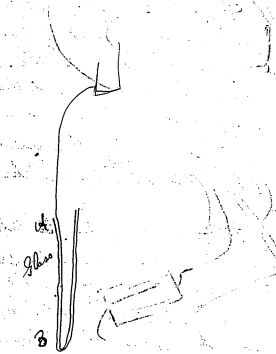
$\frac{v}{V} = .00044$ $\quad p = \frac{x}{\frac{v}{V}}$

$$p = \frac{.00076}{.00044} = 1.72 \text{ mm.}$$

Pump No. 5 Oct. 17, 1879. 165







In starting not enough Hg in the MacCleod gauge and air bubbled in carrying Hg into pump. Some fell into the Hg H_2SO_4. The pump was opened too quickly and Cu was also carried into the H_2SO_4 where it united with the Hg and now the mixture was slowly attacked by the acid giving off bubbles, spoiling the vacuum.

A long glass tube was used to take the place of the rubber one. Bubbles from half way from the vessel to the bottom A. B. Bubbles seemed to get in at A when there was a vacuum when the Sprengel was shut off. The tube changed for rubber so that the joint at B should be under pres-

ounce and the air in the tube A.B forced out by means the thumb and finger

Oct. 19, 1879. A stick of carbon brought up in a vacuum to 40 candles (2ay). Mr. B— trying to make a shiral of carbon. Screw in the pump. Snap broke. Tryed to make carbon shirals

Oct. 21. Stick of carbon about .020 and ¼ inch long gave cold 4 Ohms incandescent 2.3 Ohms. very good light Rt. minutes Smelled.

22
22
44
44
484
44
1936
1936
21296
5851.84
1703

24
24
106
48
556 2.7679
144 1.6466
29 8.5375
2.9518

895

Oct. 22, 1879.

Carbon spirals and threads

Trying to make a lamp of a carbonized thread. 100 Ohms can be made from a inch of .010 inch thread.

A ~~thread~~ thread with 45 Ohms resistance when cold was brought up in a high vacuum to 4 ~~ohms~~ Ohms about. It remained constant for two or three hours and then the resistance seemed to concentrate in one spot. Resistance cold 800 Ohms.

172

170

Thread lamp filam
1.5 Volts 3.05
3.24
around 6.26

26.5 Volts around lamp

comp 1.5	9.8213 81
26.5	1.43 32
6.26	.7966
	2.0536

113 Ohms in lamp

26.5	1.4332
26.5	1.4332
44.3	1.6461
comp 113	7.9463
	2.4588

288 4.5185
2.4588
2.0597

114 per Horse power

174

13 1.1139
1.1139
2.2278

14 1.1461
1.1461
2.2922

1.2041
1.2041
2.4082

17 1.2304
1.2304
2.4608

175

Thread

31.3 Volts on lamp

1.4 Volts

amp 1.4	9.8538
6.26	.7966
31.3	1.4935
	2.1459

140 Ohms after ½ hour

	1.4955
	1.4955
	1.6464
	7.8540
	2.4914

310 ft lbs

	4.5185
	2.4914
	2.0271

106 per H.P.

light equals about ½ candle

Lamp 1 hour
on 3-45

Thread carbonized and lamp black. Very brilliant light all the evening on Broke.

Paper plain No. 3

Thread with lamp-black very fine light on several hours giving out two or three candles and an hour and a half giving a gas jet. No Change. two candles loading wires brought.

None of these carbon spirals
blacken the glass

Lamp thread five
seconds. 196 Candles
after bringing up the resistance cold Becomes 265
the 275 – 285
Giving about three candles
resistance 187 Burning
required 82.5 Volts
1610 ft. lbs. Nov. 5, 1879.
20.4 per H.P.

Nov. 3, 1879. Lamp A. L.

Six coils thread .02 Franklin

Resistance cold

85.9 Ohms

Cherry red R = 53.86 Ohms

ft lbs 1251

Bright red R = 50.61 Ohms

ft lbs 2467

White Bright R = 49.76 Ohms

ft lbs 2702

Brilliant White R = 47.6 Ohms

3.348 ft lbs

See Book 28 page 180

Nov. 5 1879 163

Lamp No. 18 Six strands No. 200 thread

Resistance cold 75 Ohms

Brought up suddenly and air exhausted several times. About 4 or 5 vacuum each time Pump No 4

77 Ohms Cold

White one hour 78.7 Ohms cold

79.7

Very last few minutes 84.7 Ohms

Platinum sphere carbon thread was attached to the Pt. wires too large. It contained about .00061 Cu. inches of material estimated Vol. If this could contain and hold 800 times its bulk of air it would contain 1.22 cu inches

~~Expt. B 44~~

To test whether the carbon is reformed. Take the times it takes the lamp to burn alone when the lamp being cut off.

7 minute 31

~~Expt~~ at 6.47 my temp. was 63 — 107. I had my cork turned off, and hereon my lamp put out. I put my hand all of the ~~gauge~~ gauge all ready. At 6.51 I cut out the lamp. ~~Expt~~ Expt. my stop cock and set up my ~~gauge~~ gauge. My ~~gauge~~ gauge showed 55 — 109. I ~~had~~ had ~~Expt~~ a second time letting it have some time when the ~~gauge~~ gauge showed 55 — 109. After letting this ~~gauge~~ gauge down for 9 m. I put it up again, and it showed 54 — 104. I then put on my lamp at 7.10 turn of the stop cock and ~~had~~ had again ~~gauge~~ gauge showed 53 — 108

I got a good vacuum at 7.30 — 62 — 107
Sealed it again and at 7.40 gauge showed 62
4. Shown the lamp to Police gentlemen at 8.30
Left it on for 24 hours
Measured its R at 9.01 was 95 ohms at 9.3
Measured 95 ohms Nov 6 1879
Sealed it again and at morning gauges 50 — 107
Then heated lamp, and Kept on pumping
The mercury tap which the glass tube attached to pump leaked. Then lamp after bringing up 20
[illegible]

Lamp No 25 when cold measured 1050 ohms. I then adjusted My battery so that it heated the carbon not red, And kept the current on and my gauge showed a good vacuum about 46—108. I then added 3 more cells, and it heated it up to cherry red, and about ten minutes afterwards the gauge was 58–108. I then added 2 more cells, the last 2 cells added made it a little more red, gauge showed 68—107. I now added another cell this one being a chromic cell, the others being Fuller. I measured its R was 415 ohms. gauge showed in a little while 63 — 105

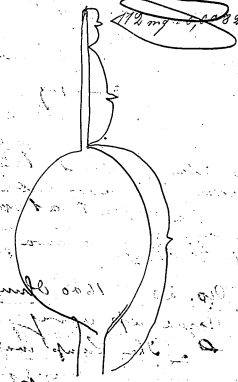
I then added another cell gauge showed 63—107
I now added 2 more cells gauge showed 32—106
Measured R was 420 ohms
I then added another cell. In about ten minutes I added another cell. I noticed an arc on the spiral. It broke where the arc was, gauge 5—105

I commenced again in the evening on the other spiral No 24 which was heated once before. The gauge showed 58—106. I put the current on it and heated it. (all batteries were on) the gauge showed 4—105 I left the gauge a little afterwards, and it was below reading.

measured to R, gave 2 Megohms Resistance. Measured it on the gauge about half an hour afterwards and it was 3—10⁵. The vacuum did not increase much, and we began to blow itself about ten o'clock and worked it half up, so that at nearly midnight it gave away.

Tread Exp. 20 1600 Ohms old. Came up very irregularly. The lamp was placed in a circuit Around the shunt A. After bringing up the shunt A was opened and the lamp was melted. Perhaps coincidence perhaps discharge from magneto.

192



No. 1 in Pipe 193

No. 30 cold 2.35 Ohms

No. 2 X pipe

~~No 30~~ 3.07 Ohms

No 29

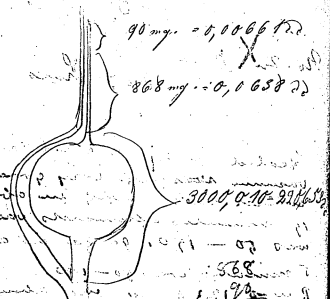
Heated No 29 to a white heat vacuum was not very good wheel not read; in about 15 minutes afterwards vacuum was 50 — 150; gauge in about 5 minutes was 50 — 100

R was 12½ ohms. in about 5 minutes gauge was 50 — 71

gauge was 50 — 69 R. now 120 ohms gauge was, when ace chrome was on, no. R being in circuit, was 50 — 90; gauge showed

50 — 60

194



195

3.000010 6.4771
958 2.9814
3.4957

3130 times as much in bulb as in tube

$\frac{60}{76a} = \frac{3}{38} = \frac{1}{12.66}$ 3)38 / 1266

3130
12.6
18780
6260
3130
39438.

1.000000 6.
4.5958
1.4042
25.37

30 mm = 25 M.
6 mm 60 25 M
3 mm
3/5 mm

1900 No. 29 Jan jet about 1.4 E.

5°2 : 145 : 24 : X 66.9 Ohms

2.1614
1.3802
8.2840
1.8256

26/24 1 Weber

6 3/4
3/18
2

72.5 1.8603
72.5 1.8603
comp. 8.1744
1.6464
3.5414

3480 4.5415
3.5410
.9771

9.4 per H, D

No. 29 gave an apo
about the commutators until finished.
1/4 inch sandpaper
No go.
got a good Vacuum then
I put on the machine tested
my vacuum, which was 60-60
Brought it up suddenly
and made test as follows

7.3R : X :: 120° : 158° = about 55 ohms

Volts consumed 79
79
711
553
6241
44
24964
24964
55 | 274604
4992 fills about 6 3/4 Pts.

about 3 gas jets
1.4

198 No 37 white when before heating 9000 R.
37 before heating 470, after heating it to a white heat R was 300.
about an hour incandescent
R = 265
about half an hour incandescent
R = 310
"Busted" on pump

No. 37 Burnt on the pump from an arc

No. 31 cold 2000 Ohms 99.
Piece of paper.
This did not become even red.
No. 38 cold 3000
Thread. Did not become red.
Both these lamps at almost the same moment burnt up forming a bad arc melting the conducting wire. Perhaps they suddenly carbonized and reduced their resistance freeing an amount of air which allowed the arc to strike F.R.L.

200

3 p cold 18000 Ohms

brought up 155 Ohms

Good lamp showed two or three jets without change Mr Lowrey & Wright saw it. Sealed off and shown in middle of room small arc at limit of contact.

1 P.M.

Nov. 14 lamp on 2 hours

9 A.M. 140 ohms Stuck @ 3,000 ohms

4 P.M. 140 ohms Stuck @ 6000 " "

5 A.M. 140 No arc.

2/39 19.5 Volts on resistance 21.8 Ohms.

1142/71 Volts on lamp

19.5 : 71 :: 21.8 :

Two measurements candle power 10.5 to 17

No. 21 cold Mounted

260

No. 1 w. 75 Ohms

Burstein. Two lamps placed in multiple and the connection to one of them broken and the other lamp burnt with a bright flash.

71 1.8513
21.8 1.3385
Amp 19.5 8.7100
1.8998
79.4 Ohms

1.8513
1.8513
1.6464
8.1002
3.4492

2810

4.5185
3.4492
1.0693

11.8 per H.P.

202

No 41.

When cold, the measured 10000 ohms. It is about to of inch br. and 3 inches long. Ignition spark passed through it and air driven out. At first no spark afterwards a fine light vacuum glow.

A vacuum of $\frac{4}{2.3}$ M

= 1.6 M obtained Nov. 13

Nov. 15, 1879

Francis says that the resistance of the lamp yesterday was 147 Ohms and constant.

This morning on three hours after considerable moving and jarring

134+ Ohms !

134+ Ohms !!!!!!!

11-12-30

1 to 4 P.M

4 hours
5
4.1/2
3
12 1/2
3 1/2
16

Monday Nov. 17

Rest A 8-30 A.M

Resistance ~~vacuum tube~~

147 Ohms momentary contact

137.7 Ohms current 8 cells in bridge

Lamp off 12 M

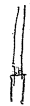
204

146 ohms tapping with key

141.5 ohms on all the time

this last was made 130 ohms by tapping showing that the one which could be seen was a break.

Broke off at the clamps 21 ohms



W42

Spiral No 15

201

R when cold 157 ohms, after warming 0—60 it was heated to a red its R was 114.7. V

Are at clamps.

A = 43 Nov 19 1879
B = 44

Two Lamps A + B. A when cold 1700. B when cold 1900
Put a vacuum gauge was 0 — 90 B ~~was~~ was heated with the current and then measured 128 ohms.

A put in series with B and became first dark red then with a large part bluish then bright red. While B did not come up at all
430 Ohms
The Yellow red for seven minutes
133 Ohms
Both Lamps in series almost exactly alike at the dull red

208

10-45 pm In multiple arc

Yellow

12 M. The vacuum became very fine and soon does not seem to change just

When the spirals were cut off the vacuum made quite rapidly

Spirals on cold vacuum ~~1 P.M.~~ soon

2 P.M. Spirals put on yellow bright

Exhausted the air out of 43 at the evening. after being exhausted and cold measured 115 ohms. 44 was also exhausted and measured 112½ ohms

44 was to are opening and would be very badly be connecting wire but did not effect the exhaustion.

43

209

Nov 20 1879

two lamps No 45 & 46.

No 45 when were 380 ohms

" 46 " " 410 ohms

No. 46 showed a small area. sealed off, small break near the clamps. but in stand

45 Vacuum remained quite fine

Measured 145 Ohms cold

7 1/2 Lamps sealed off

with ~~100 ohms~~ 120 ohms hot

Nov. 20

No. 47.

after Carbonizing 430 Ohms

3-45 P.M.

Moderate vacuum put on for a short time

Yellow # 112.5

vacuum very poor

Nov. 21

Again heated

107. Ohms

No. 48

after Carbonizing 430 Ohms

Red 285 Ohms

Yellow 225 "

Higher yellow 207

~~vacuum very poor~~

~~48~~ Nov 21 Yellow

2.01 9

Bad photo

Very Bright 203

212

43 100 Volts on lamps
14 Volts on resistance

4158
14.5

100
100
10000

49 125 Ohms
Bad are N.G.

Nov 22 1898

50.

214

Nov 24. 1879

55. when cold before heating
2700 ohms.

56 When cold before heating
about 4000 ohms.

56 heated beside for a little
while, went down to 150 ohms.

55 Went down to 186.

heated an hour or more

168 Ohms

215

56 Cold before heating
4000 Ohms

heated for a short time
1786 Ohms

91 J.
heated an hour or more.
160 Ohms

216

57

When cold before Eating
R was 255 ohms
Heated it for a moment
and it went down to 115 ohms

Mrs 58, 59, 60, 61 Left on the counter 217
moment 3 P.M.
When cold before heating
about 17,000 ohms R.
Dull red good
1000 ohms
Very even yellow 187 ohms cold
after supper I measured it
it was 1.6

218

59

When cold it measured
2500 ohms R. This was before
heating
Fair vacuum
Dull red good
1570 Ohms old

Poor vacuum very even
yellow not bright
164 ohms

Measured after copper 147 ohms

60

When cold it measured
1900 ohms R This was before
heating
Excellent vacuum
Comes up to yellow
155 Ohms old

Good vacuum
Bright yellow 142 ohms old

One hour and a half
air leaked into pump

220

61

When cold before heating
measured 312 ohms R
First coming up moderate
vacuum irregular Brightened
245 ohms

Good minimum
Bright yellow 135 ohms

62

221

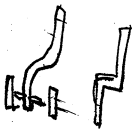
222

63 when cold it measured 430 ohms - This was before heating

64

When cold about 10000 This was before heating. Put the current on and [illegible] it burst

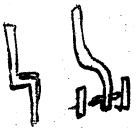
22



224

65

When cool before heating its resistance about 190 ohms
The current was put on for a moment and it was reduce to 132 ohms.
~~Current was 132 ohms~~
Current making ~~them~~ it ~~this~~ about an hour bright yellow 122



225

66

when cool before heating its R was 190 ohms. It was then heated for a moment and its R was reduced to 132 ohms.
Current ~~has~~ ~~held~~ yellow about an hour
185 ohms

226

67.66 broken

227

228

70

When cold before heating the R was about 1900 ohms after heating a moment it was reduced to 168 ohms

71

229

When cold before heating 310 ohms. It was Then heated for a moment and it went down to 141 ohms.

Nov. 28, 138 ohms. marked

In cool room weighted 148 ohms

Copper dust in the bulb

360
120 Volts
120
144 00
44
576

5.80161
1.96579
3.83782

576
92 | 633600
6884

4.80851
3.83782
.68669

25 | 360 C.V.
25
110
100
10

M.C.
6.4
576
864
92.16

Ref page 236

72 When cold before heating 270 ohms. Heated for a moment resistance was reduced to 100 ohms. Measured afterwards, it had the current for a while and ... 114

73 When cold it measured about 220 ohms. when heated for a moment it was 177 ohms. after the current being on for a while it measured 185.

When weld before hunting
it measured 365
after hunting it was
reduced to 160 ohms
very rot 169 ohms

78 there in it was a knick.

Page 229 22 345 / 115 Volts

~~22~~ 115 ~~230~~ 2
166
50
44
6

6.4
4

22)345(15
22
125
110
15

15.6
6.4
6 2 4
9 3 6
99.84

15
115
575
115
115
13225
44

5819)3300000(5.6
29095
39050

529 80
52900
58 19.00

Book 9
5.4 per H.P of large flame gas the E.L. being ~~of~~ ~~the~~ ~~E.L.~~ ~~being~~

Yo when cold before heating it was 1100 ohms after heating and atmosphere it was reduced to 340

when I put the current suddenly it burned at one of the ends.

Cold unheated 8.00 Ohms

81. Bright red 920 Ohms

240

82

Short circuit. Before heating it was 4.00 ohms.
When heated for a moment was reduced to 3.00 when finished 2.50.

241

19 : 259 :: 6.4 : 128 Volts

259	2.4133
6.4	0.8061
19	8.7213
	1.9407

87.2 Ohms

19)259(

128	2.1072
128	2.1072
44.3	1.6464
.873	8.0593
	3.9201
	4.5185
	.5984

88.20

3.9

84 Before heating 2500 Ohms
Very bad spots and slightly
bent in first bringing
up after bringing up 204 Ohms

85

86 Before heating 400 ohms
after moderate heating 155 ohms
remarkably even at red heat

210

911

92 before hunting rop

93 700 before heating

94 Before heating 800 Ohms
Very even heat at red
Incandescent for a very
short time 205 Ohms

95 800 before heating. There is an arc on one of the pools.

No number marked X before heating 700 ohms

256

No Number, marked 1

About 700 before hearing

255

700

White spirit before hearing

630

218

101

before hearing 3.50

219

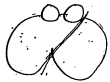
102

before hearing 4.20

141 before hunting 295
142 gi [illegible] 300
143 after hunt the first time 192

262

1



1 cum
2 work 4

1 x 2 = 2

2² x R = E

0/0

2/2 = 1

C = E/R = 10²⁰/2 4 5

20/2 = 10

C x R = E 3 x 2 = 10 E
11 x 2 = 20

C² x R = X = 25 x 2 = 50
50 x 2 = 100

E² * R² x R = X

100 ÷ 4 x 2 = 50

E² * R = 100 2 50

1 1st 1 2d = 1 work
2 1 = 2 4

2² x R = 4

24

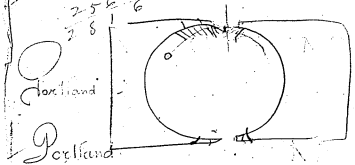
35,

Slots 700 foot

14
4
56

64
44
5 5 6

2 5 6 6
7 8 1



1.4
1.4
56
14
196

1.4
1.4

29 | 33000
16500
204

206

206
20
4120

205
20
4100

201
20
4020

202
20
4040

2668

Phonos

London.

90.

10.

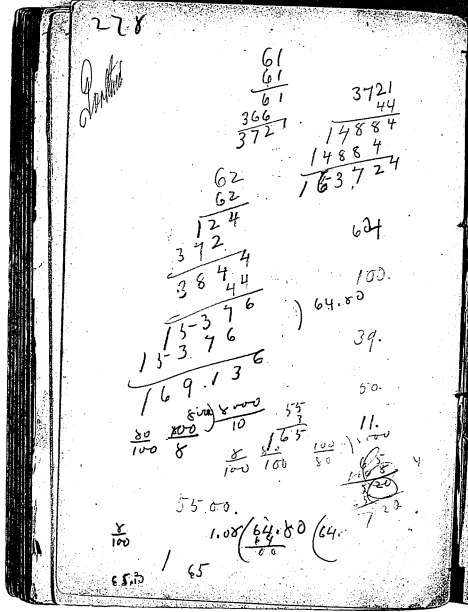
80
80
6400.

20
20
400

450
450
17,600.

8800,

4400,



2304

89100 2
78200

55

60
60
3600
44
144 00

48
48
3841
192 4
45 2 3

144 00
144 00 60
1 55 54

40
60 44

55
3

50
25 24
64 00
64 00
1700

45
45
2025
180
20.25
81 00
81 00
40 00

10
17 00

81 00
81 00
89100

4.

89.100.

1.08
21.60

1.08
21.60

2 ohms 50 volts

~~200000~~
110 000 ft lbs -

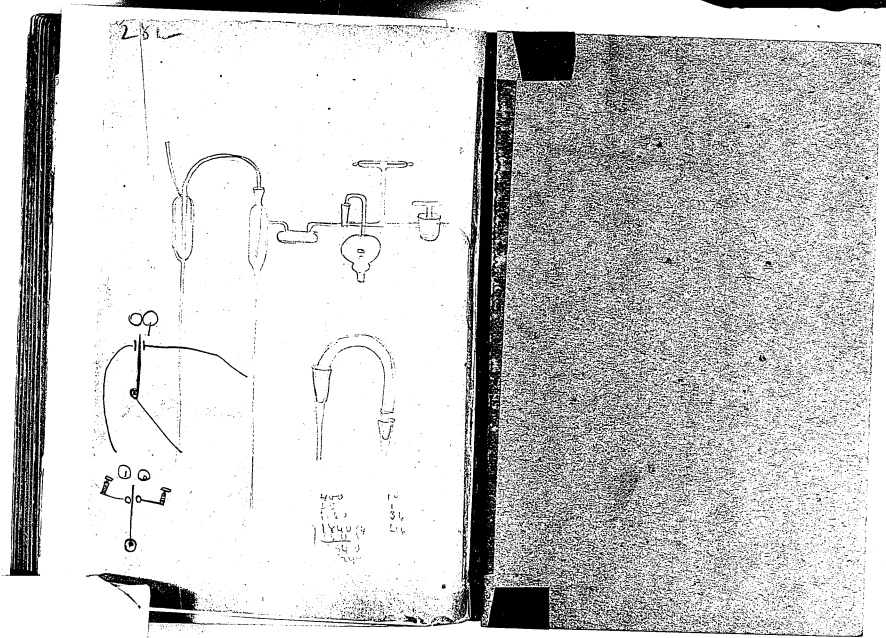
3 : 1.08 ::

3 :
21.60 : X :: 3 : 1.08

21.60
3
64.80

21.60 : X :: 3 : 1.08
46

1.08 | 64.80. (60
0 000



Menlo Park Notebook #86 [N-79-09-18]

This notebook covers the period September 1879-January 1880. The entries are by Edison, Charles Batchelor, and James Seymour. The book contains notes on telephone experiments and lists of telephones packed and shipped to England and elsewhere. The label on the front cover is marked "Telephone" and "New Receiver." The book contains 266 numbered pages.

Blank pages not filmed: 136-138, 143-155, 176, 179-191, 222-245.

Missing page numbers: 139-142, 145-146, 177-178, 211-212, 227-228, 247-248, 251-254, 257-260.

No 86

LIBRARY OF THE

BOARD OF PATENT CONTROL,

120 BROADWAY, NEW YORK.

GENERAL ELECTRIC.

_____, 189_

No 86

44 vs Edisons Experimental Inst

We find that the reason we cannot adjust the hammer of the transmitter out far so as to get it loud is that when adjusted to get very loud talking that there is a reciprocal action between the receiver and the transmitter locally & also between the two stations, and this action causes squeaks, & microphonic effects leaving the impression that the fault is all in the transmitter being to delicately adjusted whereas

its not the fact. because when the transmitters at both ends are adjusted so that the talking is all scrape squeak & rattle & scarcely intelligible the slop[illegible] of the Receiver handle by the transmitting gets comes clear & loud and the transmitter may still be further adjusted out. The action is this when turning Receiver, or closing push Button the receiver diaphragm gets a knock this is transmitted through the air and through the

bracket to box & thence to transmitter
when quiet a wave thru wave
reacts on the receiver which
retransmits to the transmitter and so on
giving a perfect squeak in the
act of talking the receiver
diaphragm of course works and
these waves retransmitted through
air & arm to transmitter
produce a confusion of rattle &
squeak rendering the talking
unintelligible at the distant
station & also creating the
impression that the transmitter
is adjusted out too far.
Organ In addition to this
reciprocal action locally

There is reciprocal action
between the terminals. Thus
on closing push button the
receiver sends a knock locally
& the distant receiver sends a
knock to its transmitter the
two transmitters rehearsal.
this knock hence speaking
If Batchelor is turning
& I am also my push button
acts on his own instrument
the same as his own though
not so strong.
We took arm off of instrument
held it in hand 2 feet
away the talking was

loud + perfect upon an
adjustment which we couldn't
understand. scarcely a
word with the arm screwed
to base, We then worked
push button, and brought
receiver within one inch of
mouth of transmitter still
holding in hand and closing
push button and giving an
initial knock we obtained
a musical note which only
stopped when receiver was
2 1/2 inch away. the closer
the receiver to transmitter

the higher the note,
on putting the arm on wall
3 feet from hammer base
we got a reciprocal rate.
it interfered badly with
talking when put on
wall 10 feet away.
all these effects are done
away with when a back
print is put on push button
to open reciver when talking
his reciprocal action can
take place on the margin

is enormously increased
we find that the idea of
wanting facilities for
interruption is nonsense. As
in N.Y. your own voice drowns
the interruptions + they always
wait until you are through
with a sentence, In England
where they don't like to
be taught they can be
taught one way as well
as another = Another
increase in Margin

by this device is due to the opening of the tertiary thus preventing to some extent the Short circuiting of the Secondary wave in its own coil,

We find that the Wallace Carbons have more marginal for adjustment + work better than Jablochoff this is explained by looking at them under the Microscope The Wallace Carbons are composed of particles

More finely divided than Jobalkoff – on a fine test we found the latter Carbon impurities there oozes out a brown stuff totally obscuring the Carbon particles, in Wallace only a very little white stuff comes out, the result of Jobackoff is 40/100 of an ohm which wallace is but 23/100 another point in its favor

We found that when the springs in the chalk form a groove we drew away (12) more in one week than

on the other that the rubber pressers may have a slight Cant given it so as to increase the pressure on the side where it shows deficiency in the way we make perfect grooves

We find that it is preferable to wet the Chalk in the manner as when damp ~~the~~ chalk before the water fairly gets in it is in a soft state & the pallidium makes a nice groove in the act of something

20

21

when first they
palladium does not grow
at least for a long period
make a nice ground.

~~Ltf~~

Char Batchelor
Page 1-21

16/480
30

9/16/1.4 77
16

9/4.60
53

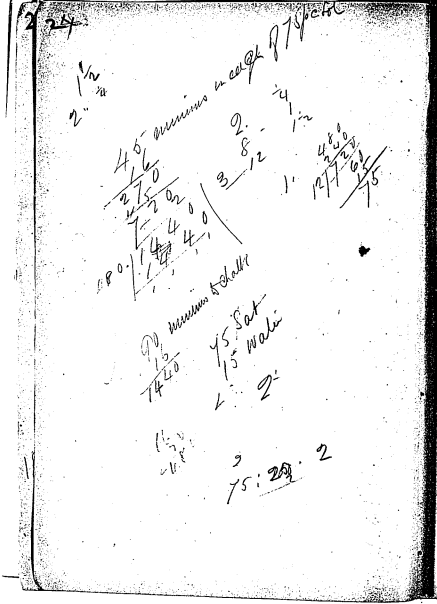
.88
120

½ chalk
⅛ Cal. Sol.

18 = 16/2
18 | 2.00
18
20
14
2

18 - 16/2
18 | 1.40 . 77
12 6
140

1/12 B = 40 minim
as 75 : 150
25 % Sal
2.5 of what Chalk necessary
1 min = solid matter
60 min
60 min Solid matter



75 minimum Sat. Sol. plus Sodic
15 " Water

of 90 minimum going to chalk

75% or 67½ of Sat.
25 " 22½ of water

25 of 75% concentrates Sol.

1# Chalk
1B of 50 pc Sat.
1B of Saturates 450

1# Chalk
2B Sat. Sol
½ of water

Sept 18. 2 AM 1919

Chalk cylinders — Shortt & Satchell

We find that chalks must be wet with a solution of

75% of Phos. Soda. Sol. Sic.
25% water

and to every 15 button there must be 90 minims of solution put in, but as we turn away a great part of the chalk we must put in the same percentage of the 90 minims as there is percentage of the chalk left after turning

We pressed up some cylinders as follows: —

10 chalk presents 7/8 talks decent.
" " " " 8 washes more same
" " " 2 " " much harder
" " " 3 " " same
" " " 4 " " same
" " " 5 " " same
" " " 6 " " about same

These were only left till noon 1st 2 pm when all but the first had deteriorated and that was as good as the 3rd was at first

Chas Batchelor

Sept 18th 4am 1879

Chalk Cylinders

Chalk Retorter

Made 5 pair of chalks of old formula

2 ℔ Chalk
¼ fluid ℔ Sat Sol. Phos Soda

These were wet whitest in the instruments with 15 minims of a solution of

50 pc. Sat Sol. Phos Soda
50 pc Water

Each of these was made by weighing out 1 ℔ of the mixture and pressing with 3, 4, 5, 6, & 7 washers

Chalk with 3 washers talks pretty fair
" " 4 " " little better
" " 5 " " "
" " 6 " " good
" " 7 " " red hot

~~In this 7 washer one it took more pressure to force down the ram to the~~

head than in the pure chalk and
still it was softer: this must be
due to the fact it has some
water in

28. is one that measures well but can't get any shock except on tongue. Kruzi takes it apart

45 - Red Hat shock
29 - Fair, not so good as 45
39 - Hat
49 - Hat not so good as 50,
35 - good not so strong as 45
32 - no good weak
50 Hat
51 Hat no good - God weak
25

34. Pallad. Chalk ~~in hat~~ flat gut a high place in it makes a narrow track. in two rings 1/16 wide each ring 1/32

52 - got bad turning mechanism
it will do but is not true

Telephone Left 3s 1879 39

Nos. 42. 47 45 41 48 49
30 39 32 34 31 51 50
52 25 36.

All sent to London today
These were all very loud talkers
No difference between any of them
All new transmitters with disph.
adjustment—

Chas Batchelor

Telephone Oct 1st 1879 KJ

Seated

43 Bully O.K. Paraffine wired Core talks very loud – up to Standard

46 O.K. Paraffin wire core This is very good but a shade low at 3 inches away.

33 O.K. Bang up. up to Standard

28 O.K. Bang up. up to Standard

Chas Batchelor

29 O.K — Bang up
Up. to Standard

24 O.K. a little low at first but brought up to Standard by turning backward and forward for some time

26 O.K Bang up

35 O.K This one had a coil in it that was measured and marked '40 primary — afterward Frances measured in the for '20 & when took out he measured it '40 again but another in and it was O.K.

Telephone Oct 3 1879 45

Chas Batchelor

Telephones 37 & 40 were put up and tested to-night. They worked elegantly and were taken by Rice & Lundin Oct 4th 1879

Two telephones were given to Bergman for models they worked elegantly right off

Telephone Oct 15 1879 47

35 Telephones Nos. 85–119 inc – sent to London today –
In testing them we find them all a little lower than they ought to be but very good
We sent 23 on Oct 9th which were all low on testing but when we put in the bitted spring they all belched right out —
We cannot at present account for the fact that these 35 are a little lower than standard
Chas Batchelor

Telephone — Oct 15th 1899

We pressed some chalks from new mould (that is the one made for the small chalk) and in order to get the right pressure we took ~~one of~~ a chalk moulded in large mould and turned the diameter to fit the small mould and weighed the Chalk —
We now put in same weight and pressed to same thickness This however seemed to make a softer chalk and it did not work loud Weight exactly 1 Bs Troy.
We now put in 1 Bs 3 dwt and

pressed to same thickness
these talked right loud before wetting
and fairly belched afterwards

We now took 2 more chalks of
10g weight and the first talked
very low before wetting (much lower
before wetting) after wetting it came
up very loud in fact a belcher
compared to the 36 tested yesterday
the second I put more pressure
in the polishing operation and
it talked moderately before
wetting but was exceedingly
loud after ———
The difference between these

two Chalks and the two on page 49 of same weight is only that those on page 49 were used immediately after moulding and the latter two were allowed to stand 1½ hours before turning up.

We now put on 10 lb 1 dwt and it came loud before wetting and after wetting was perfectly damned horribly loud

We now put on 10 lb 2 dwt and it ~~came~~ talked a moderate bit uneven before wetting after wetting it did not increase it much

54

55

We now put in 1 ℔ 3 dwt
These don't 'click' like the
ones of same weight on page
49 – We cannot understand
the reason why – These were
turned by steam instead of
foot power & had marks on
one side owing to the lathe
being out of balance – These
gave a sound similar to
a phonograph when after
~~the~~ making a good record
was not set in deep enough
in reproducing

telephone Oct 16 3 AM 1944

We now put in 1 oz weight
mixed much better in feed
thoroughly

5-8

Telephone

Oct 16th 10pm 79
1879

Charlestown

We now began a series of experiments to extend over a length of time, making 2 chalks of a kind and keeping them under glass jars :—

No 1 Moulded from large mould turned with a glaze polish by perhaps a dull tool — Came moderately hard without wetting, after wetting & turning they came first class belchers — mark white — Show no cutting of Palladium — peculiarity of these chalks is that with certain pressure

60

61

the more you turn the harder they go — that is friction increases — this is what we desire

They were will ground before pressing and weight 1 ℔ 15 dwt

---

2 These were 1 ℔ 17 dwt
Before wetting twice as loud as No 1
After wetting not much louder if any than No 1 and about ⅔ louder than before wetting
These do not talk as loud at 3 inches away as No 1

---

3 These were made exactly as No 1 — they are equal at 3 inches but not quite so

loud in the mouthpiece
Talking seemed to be sharper
but not quite volume, whether
this be due to chalk or trans-
mitter, Cant say — these chalks
had no glaze consequently on
Martin grinding the tool —
We now find by altering the
transmitter a little that these
No 3s are exactly equal to
the No 1st — We find that
turning the chalks by hand
and getting no wool marks on
surface, gives us the increased
friction by turning which
is so necessary to good working
chalks.

64

Oct 17th 8 AM 1879

404

These chalks were 10s 16 dwt —
before wetting Tatted quite loud
— after it was a regular Yelpher!
at 3 inch away same as No 1

Charpentier

Wet

133
143
135
132
147
127
129
126

129 - wants new Chalk -

138 ~~[illegible]~~

121

120

122

139 130
131

123. 154 - new Cat. Trans. not a defect

150

136 166 " "

128 148

130 - not wet

134 - wet - not right at have new chalk - duly I

137 - Moderate Talker -

141 Little better than moderate,

140 - Fair. better than 141.

122 Moderate. Lit bet-

120 Fair = Transmitter bad want braking yet - Batch says Co low -

133 - nearly a Belcher - OK -

143 Moderate Belcher. OK

135 Fair ——— OK -

132 Nearly Belcher OK

121 - Probably no button on Transmitter

128 Moderate — Think primary crowded - whether opened or closed talking just as loud — When not push hard on push - makes Loud Kick in Receiver

142 - Moderate (very) - Balch dont get me Loud -

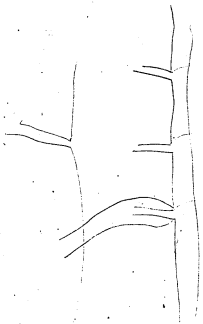
124 - Moderate, makes scarcely any dif whether signal opened or closed - Balch gets Trans good

129 - Too low - Balch gets Trans good -

126 - Fair, —— O/C Balch gets Trans OK

139 Fair - wants new Receiver handle built - otherwise OK -

131 Fair - OK - Balch says to beat trans. yet = Thru fine one & heard my own voice clear -



127 - Moderate -
136 - Nearly a Belcher - Ok

all of these numbers
@ 15 per lb. light - turned & put
in retarder 2 days -

Next Lot -

@ 16 per lb. - turned
put in 2 days

162 - Belcher Ok - Packed

163 - Belcher. Ok - Packed

152 Mod Belcher Packed

153 - Belcher OK -
quotes a rattle like loose
Mica in Receiver Gutplant
Unit Packed

160 - moderate - Batch says
Trans NG acts funny - sent to
it's perhaps, Coil bad

147 - Reg Belcher OK Packed
Batch gets good Trans

168 - Belcher OK
Batch acts good Trans Packed

165 - Belcher OK
good Trans Packed

164 - Belcher OK
Trans not extra good Packed

159 – Belcher Packed

169 – Belcher Packed

158 – Belcher Packed

151 – Belcher Packed

154 – Belcher Packed

145 – Belcher sent upstairs to Both. to use as test instrument

144 Belcher packed

161 Belcher Packed

146 — awful Beleche Packed

155 — awful Beleche Packed

156 — Beleche Packed

167 - Rattles - Chalk has low spot in it.

137 - moderate - Low

124 - Want new Chalk

136 - Moderate Beleche

130 — Beleche Packed

154 - Fair - opening ov
opening push makes
no. Diffrn Batch 9 st.
trans Red haf
after 2 days - Belches

131 - Belche Packed

150 - market = Fair - Trans good
Mist in funny coloured lens shows
dust pellets
within 4 hrs. first then

132 - Belche Packed

128 - Moderate Belches OK
Packed

160 - Mod Belches
Trans NG. Batch look at

78

80

~~136 - Belcher~~

124 - Belcher

126. Belcher, mod - Packed

124 - Mod Belcher Packed

129 Mod Belcher Packed

142 - Recem Mod Belcher Trans Low.

135 - Belcher Packed

143 - Recem Moderate Trans good.

82

133 – Reem poor
Trans good

166 – Reg Belcher
Packet

149 – Reem Belcher
Trans – Back get
nothing on it

148 Belcher
Packet

123 – Reg Belcher
Packet

138 – Belcher
Packet

120 - Belcher
Packed

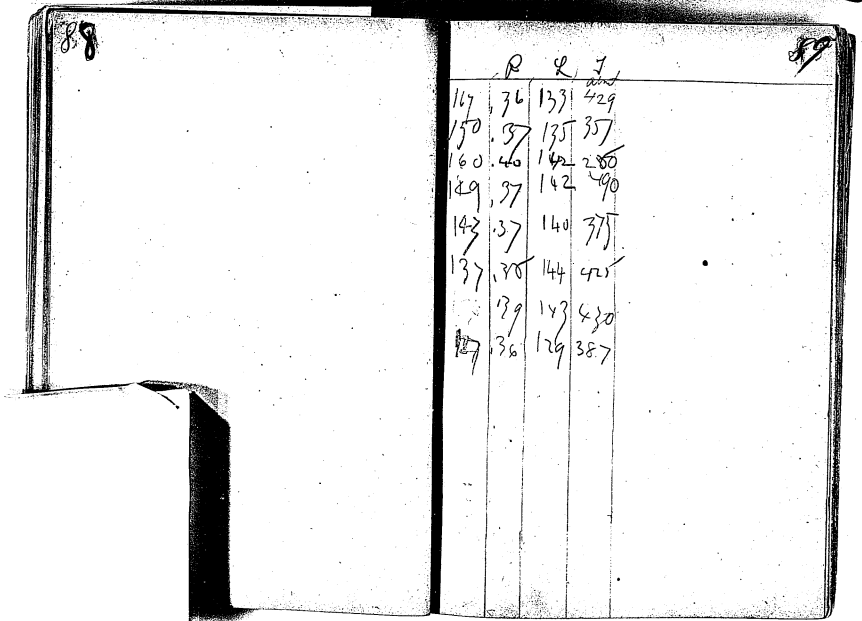
122 - Belcher
Packed

139 - Belcher
Packed

141 - Awful Belcher

140 Awful Belcher

154. Belcher



88

89

R		L	T
			dm
147	.36	133	429
150	.37	135	357
160	.40	142	280
129	.37	142	190
143	.37	140	375
137	.38	144	425
	.39	143	430
127	.36	129	387

80

91

Oct 28.

154- Belcher

121 Belcher.

127- Belcher.

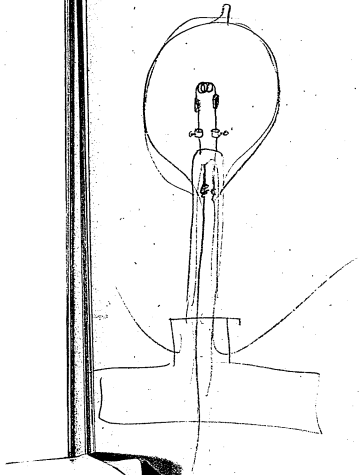
137 Belcher

166 Belcher

149 Belcher

167 Belcher when primary open but shows me shows difference of opening and closing primary more than any of them

excellent bouquet



143 Not a Belcher
Transmitter good
~~Same~~ Yours

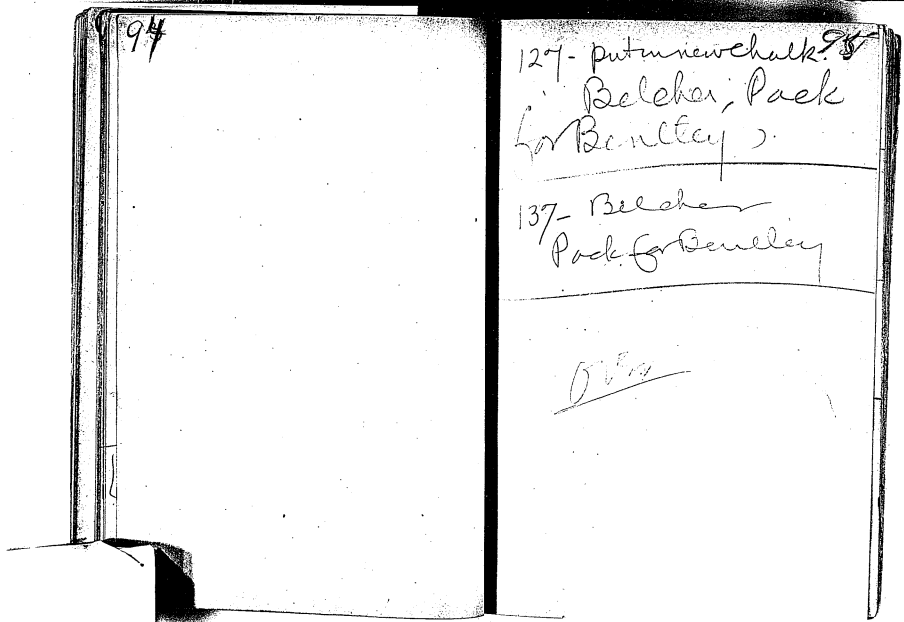
150 Belcher

133 Belcher

125 Belcher

142 Belcher but
bad transmitter

134 - Not a Belcher
wrist tell you my


94
127- put in new chalk. 28
Belcher, Pack
for Bentley).
137- Belcher
Pack for Bentley
Ovid

Barker took. Vol
137 + 179 -

170 Belcher
Dated Nov 1st 1879.

171 Relay Instruments
172 for Lighthipe.

98

— want new chalk
143- new chalk
197 - Bad Foam
212 Bad chalk & water
Jalapa flat
178 shaft runtime,

99

Nov 6th 1879

Put up air the mill
has 16½ chalk in it with
15 inch operation to 8 oz
hence this has harder pressure
than reg (16½ H₂O) - Test inst

Nov 7th 1879		
No 190	Left	Number read 30 Oct 1879 6 P.M.
" 202	Mrk	
" 189	Mrk	
" 187	Mrk	
" 188	Mrk	
" 186	Mrk	
" 176	Mrk	
" 178	Mrk	
" 208	Mrk	
" 211	Mrk	
" 179	Mrk	
" 184	Mrk bad chalk runs at bottom	
" 185	Mrk	
" 180	Mrks new chalk	
" 181	Mrks new chalk	
" 182	Mrk	
" 175	Mrk	

Nov 4th 1879.

Nov	1774	Trek
"	1783	Trek
"	1772	Trek
"	1796	Trek
"	1804	Trek
"	2098	Trek
"	2117	Trek
"	2119	Trek
"	2135	Trek
"	2099	Trek
"	2098	Trek
"	2107	Trek
"	2102	Trek
"	2112	Bad Chalk Palladium
Probably		Rock Float
Nov	2118	Trek
"	2119	Trek
"	2093	Trek
"	2103	Trek
"	1778	Shaft central.

Standard Belcher (Sunday 2 days up) Fearful Food Gas Enough

No 206 - Ok Belcher pack

173 - Not a 1st Class Belcher Keep it for Chili: Relay

176 - Ok - Belcher red hat. Pack

186 - Ok - Belcher pack -

188. Ok Big Belcher.

189 - Ok Big Big Belcher

189. Ok Belcher

202 - Ok Belcher

190 - Ok Big Belcher

200 OK Big Belcher

179 - Ok Big Belcher

184 - Ok Belcher

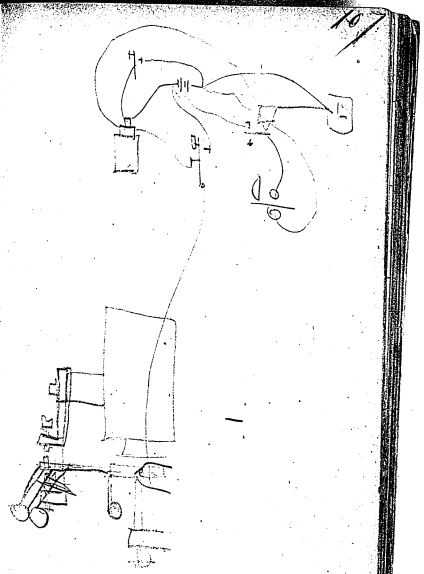
183 - Ok Belcher

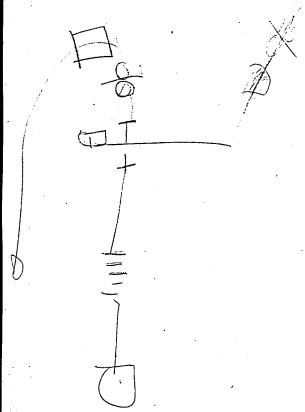
181 - OK - Big Belcher - Relay Held for Child

202 Ok Belcher Relay Held for Child

175 - OK - Belcher Relay Held for Child

106





174 – OK Rebekah but
1st 1st Class Relay.
Xmas Exhibit Chalk

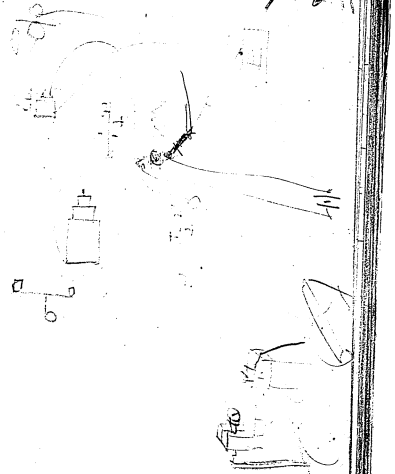
153 – OK
OK Parade

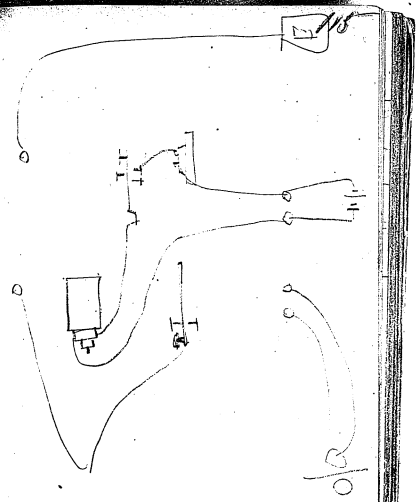
174 – OK
Relay –

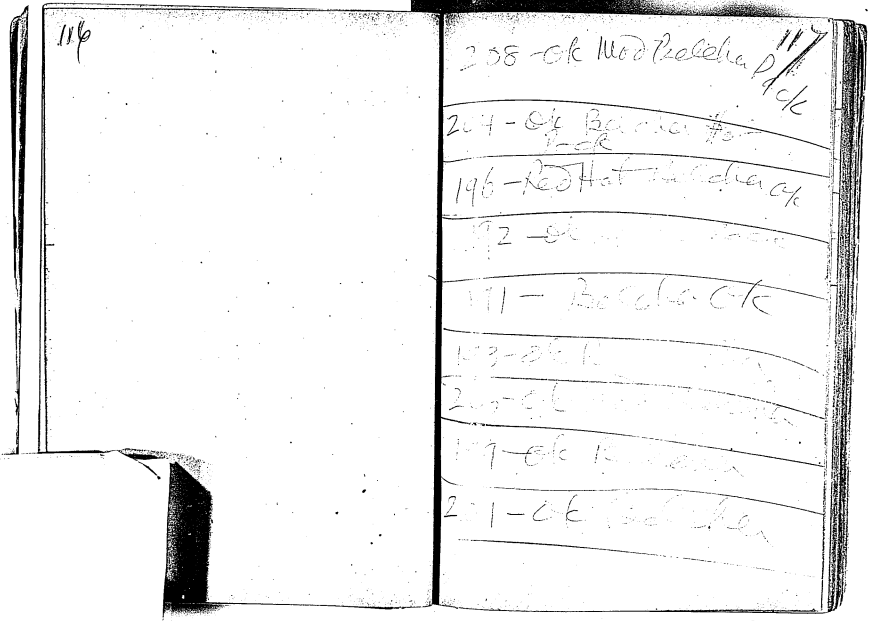
195 – OK
Park.

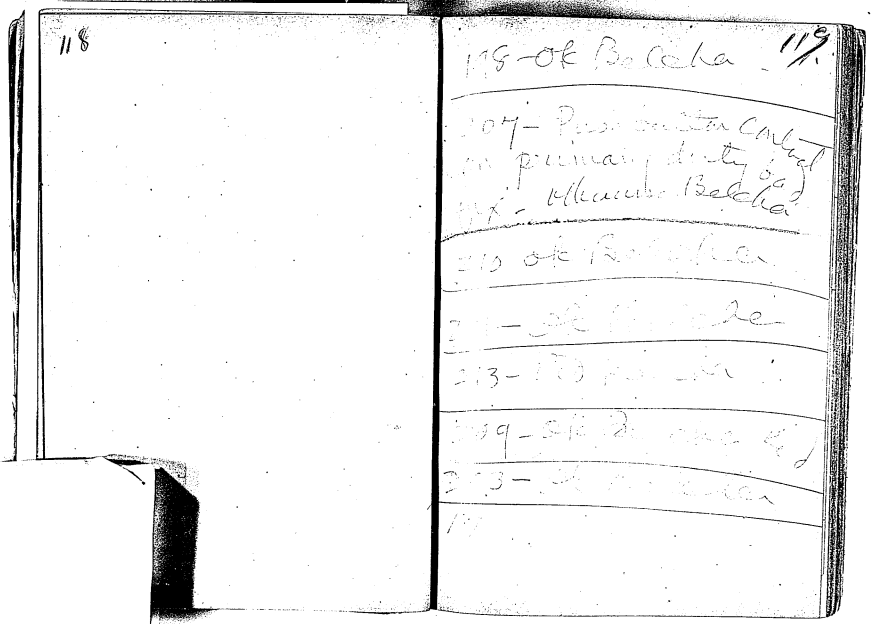
174 –

194 –
Batch
Team
OK Park.






116
117
258 - Ck Mud Prairie Ck
204 - Ck
196 - Red Hat
172 - Ck
171 - Bear Ck
173 - Ck
207 - Ck
197 - Ck
201 - Ck


118
118 of Bedda 119
207- Pure Sattva Carbon
Bedda

USE wet.

Benjamin NC, A. Vest & K. Peck
NC 13, 3 trucks
Field until with Sarge
Chalk - [illegible]
Belcher Prod. Q.R.

C - [illegible]
[illegible]
Jamieson Stability Test.

D - Benjamin [illegible] Peck

E - Benj [illegible] K. Peck.

F - [illegible] Peck.

- Benj [illegible] Peck

[illegible] Peck

RC [illegible] Kg Cathey
Kultow [illegible] Transmodder Guns

122 OK for Eaglehurst.

17c OK
1N3 OK
OK
175 OK
131 OK
M OK
OK
191 OK
OK
OK
OK
OK
OK
OK
A OK

123

J - Berg WET OC Pack

K - Berg WET Fire Line

L Berg WET OC Pack

M. Wet - OC Pack

121 - wet - OC Pack

178 wet - OC Pack

N wet OC Pack

180 wet.

145 wet OC Pack

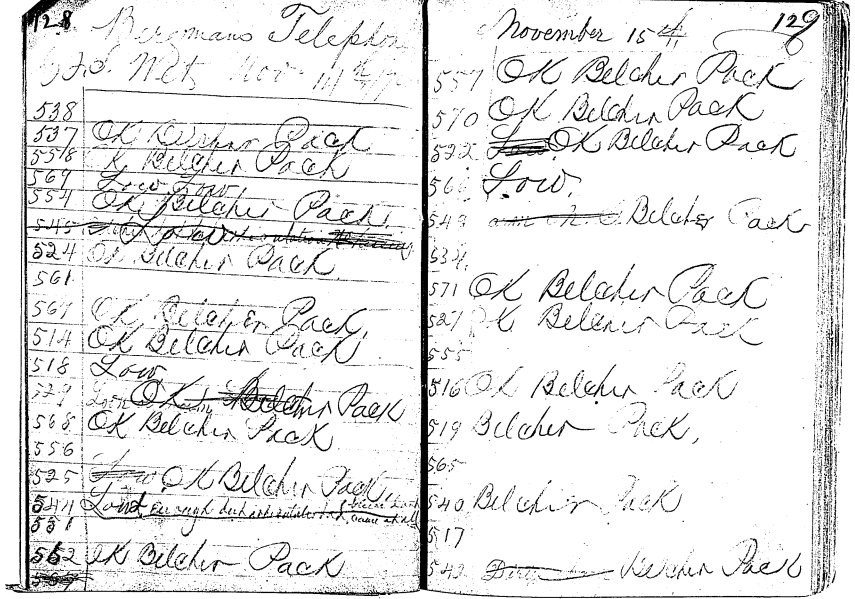
170 wet OC Pack

Dam wet East Mound

100 Has sled chain. Hold for tech tonight.

Left Hand Pound button bad
ab and bad.

13 Patients Mark taken
Left arm [illegible] in axilla
130°



128 Bergmans Telephon
O.K. Nov 11 1/4 [illegible]

538
537 OK Gibson Pack
536 OK Belcher Pack
567 Low
554 OK Belcher Pack
545 [illegible]
524 OK Belcher Pack
561
567 OK Belcher Pack
514 OK Belcher Pack
518 Low
[illegible] OK [illegible] Pack
568 OK Belcher Pack
556
525 OK Belcher Pack
541 Low
531
562 OK Belcher Pack
[illegible]

129 November 15 4
557 OK Belcher Pack
570 OK Belcher Pack
572 OK Belcher Pack
561 Low
549 [illegible] Belcher Pack
534
571 OK Belcher Pack
527 OK Belcher Pack
555
516 OK Belcher Pack
519 Belcher Pack
565
540 Belcher Pack
517
543 [illegible] Belcher Pack

Bugmans Telephones

Wed Nov. 15/79

561 Lock at arcus

543

550 Tube filtered for 145 Standard

513 The shaft plays in bends in its bearings (very bad)

530

539

548

541 Beaver Belcher Pack

523 Shaft slave to engine bearings

563 Low.

572 ~~Low~~ Low

513 Dead Pack.

555 Belcher Pack.

586 Low

165 OK Belcher Pack

Bugmans Tel

Nov 17/79

580

560 OK Belcher Pack

586

573

531

546 OK Belcher Pack

539

553

515

547

531

535

559 Belcher Pack

132

Upper Bell, Belcher's Mammoth Vein

Bergman Tenement 133

Catalogue of T. M. B.

6623 Sour

5485 Sour

5577 Sour, White Ash

5866 OK Belcher Pack

5977 OK Belcher Pack

5750 OK Belcher Pack

5855 OK Belcher Pack

5744 OK Belcher Pack

5966 OK Belcher Pack

5544 OK Belcher Pack

5944 OK Belcher Pack

5844 Sour

577 OK Belcher Pack
530 OK Belcher Pack
578 ~~Lon~~ OK Belcher Pack.
587 Lon.
145 OK Belcher Pack
563 OK Belcher Pack
588 OK Belcher Pack
~~544 Check 600 balance~~
581 Lon Wilson
597 OK Belcher Pack.
544 OK Belcher Pack.
545 OK Belcher Pack
591 OK Belcher Pack
599 OK Belcher Pack
592 OK Belcher Pack
581 OK Belcher Pack.

Lon Kennedy a crook
in the Bridger
601 OK Belcher Pack.
577 OK Belcher Pack
530 OK Belcher Pack.
589 OK Belcher Pack.
580 Lon.

2469
10
24690

2469
14
9876
2469
34566

102 | 251900 (2469
204
479
408
710
612
980
918
62

2469.

100

10

110

110 | 25190 (22.90
220
310
220
990
990
0

2290
10
22900

300) 99600 (3322
900
996
900
1560
600
1800
1800
606

3322
10
7

3322
10
33220

30,

1	300
2	150
4	75
8	37½
16	18.75
32	9.375

150
150
150
75-0
150
2265-0
2265 44
1500 00
1500 00
99600 = 44 ?

300) 99600 (332
900
1966
1500
1660
1500
600

200
44 200
40000
600) 17600 (29 33
1200
5600
5400
2000
1800
2000
1800
200

Nov 17–

Bergmans visits west Co
Jim Seymour.

B. 551 – OK

No C. obviously something
wrong Trains –

180 ours = Relay – Nothing
~~heard~~ ~~but~~ ~~if~~ ~~any~~ ~~[illegible]~~
all OK

174 Belcher OK for Chile

181 all OK " "

193 all OK " "

197 all OK " "

182 all OK " "

(Relay)
44 Chalk Mounds to Wheeler
Berths
552 very low NG
535 very low " "
544 little louder but NG
551 low NG
556 OK but not 1st class Relay
529 OK Belcher
568 OK Belcher
515 very low NG.
554 OK Belcher
558 OK Belcher
545 NG low
514 Receives low, Transmitter low

561 Big Belcher transmitter
burned
567 NG very low
524 NG very low
564 Batty fist strong NG
537 all OK Belcher
538 NG low
212 Belcher Rec OK
no good fist
524 New chair
O. K. G. Nov. 18/99
567 new chair
Jas. G. Nov 18/99
538 new chair
J. G. Nov 18/99

Note
588 Grove of pen. to ...
and dec. hard edges
...

552 OK Belsher '67
520 OK Belsher

168 19th =

Telephones Passed by C. 85

582 O.K. Belcher Pack

OK Tax

201 O.K. Belcher Pack

OK Tax

525
545 Pens Assist

560 Pens makes wide track

564 Pens assist

516 Pens Belcher wants

19th = Nov 8

526. OK Belcher. Pack 169

551 = OK Belcher Pack.

552 OK Belcher Pack

520 OK Belcher Pack

538 OK Belcher Pack

536 - OK Belcher Pack

531 OK Belcher Pack

532 OK Belcher Pack

518, Pen sideways - Low -

573 OK Belcher Pack

515 OK Belcher Pack

522 OK Belcher Pack

521 OK Belcher Pack

170

171

570 - Nata Beleke - Roast pea & thunk it will be OK

528 OK Beleke Pack.

534 OK Beleke Pack.

561 - OK Beleke Pack

519 - Pen Pekeneke (Liver and soup)

566 - Low - OK

571 - Low - OK Pan Beleke

557 - Low

533 - OK Beleke Pack

547 - OK Beleke Pack

535 - OK Beleke Pack

172

173

555 - OKeefe

517 OK Belcher Pack

543 - OK Belcher Pack

553 - OK Belcher Pack

540 - Low

565 OK Belcher Pack

559 - Low

556 - OK Belcher Pick

174

175

564 Wm. N. S.
Cor. from
Lyt lot Bergman
to it. I. 1.5
550 Ferd. Rustow
lot Bergman acc

192

264 Low
584 Low
625 Low
245 Low but wheezy pump not wrong
260 OK Pack ✓
685 Low
647 Low
624 OK Pack ✓
673 OK Pack ✓
626 Low
616 OK Pack ✓
702 OK Pack ✓
609 OK Pack ✓
618 OK Pack ✓
634 OK Pack ✓
595 OK Pack ✓
580 Low
655 Low

649 OK Pack ✓
646 OK Pack ✓
266 Thwesey
239 OK Pack ✓
261 OK Pack ✓
231 OK Pack ✓
258 Low
255 OK Pack ✓
238 OK Pack ✓
252 Low
285 OK Pack ✓
247 Thwesey
242 Low
267 Thwesey
259 Thwesey
254 Low but wheezy
248 Low

194

283 Wheezy
229 Low
253 Low but wheezy
233 Low but wheezy
228 Low but wheezy
245 O/K Pack
232 Low
236 Low but wheezy
224 cracks bad
234 Low but wheezy
256 Low
257 Low
237 Low
265 O/K Pack
240 Low + wheezy X Page 196
244 Low
241 OK Pack
659 Low

195

691 Low
663 Low
688 OK Pack
704 Low
654 Low
666 Low
684 Very low
645 Very low

240 OK Pack
248 OK Pack
244 OK Pack
237 OK Pack
689 OK. Pack
645 OK Pack
668 OK Pack
654 Pen not put right
704 OK Pack
663 OK Pack
691 OK Pack
684 No chalk
640 OK Pack
633 OK Pack
287 OK Pack

256 Chalk set wrong Belcher
284 OK Pack
224 ~~OK~~ Belcher chalk hard
236 OK Pack
282 OK Pack
228 OK Pack
233 OK Pack
253 OK Pack
229 OK Pack
223 OK Pack
254 OK Pack
259 OK Pack
267 OK Pack
242 Pen not very full
247 OK Pack
262 OK Pack

198

635 O/K Pack
258 Crank Rod
266 Pen set screw
631 Lad
580 Lad
626 O/K Pack
685 O/K Pack
625 Pen set screw
264 Pen set screw
647 New chuck
714 O/K Pack
655 Pen. new set
245 O/K Pack
584 Lad

199

Telephone Book

200

675 OK Pack ✓

201 Low
225 Low

680 OK Pack ✓
654 Thrusy
632 OK Pack ✓
613 OK Pack ✓
628 OK Pack ✓
627 OK Pack ✓
646 OK Pack ✓
639 Low handle back spring
708 OK Pack ✓
683 OK Pack ✓
580 Low
614 OK Pack ✓
676 OK Pack ✓
671 Low handle bent ○
625 Low (wait till Travis)

201

589 Pen set wrong ○
698 OK Pack ✓
227 Thrusy ○
665 handle mechanism loose ○
669 OK Pack ✓
672 OK Pack ✓
659 Low -
606 Handle mechanism ○
660 OK Pack ✓
667 OK Pack ✓
664 Low
710 OK Pack ✓
697 New Spring
637 OK Pack ✓
674 OK Pack ✓
681 OK Pack ✓
620 OK Pack ✓

705 OK Pack ✓
622 OK Pack ✓
712 Handle mechanism Cover
678 OK Pack ✓
696 OK Pack ✓
661 Lord
625 OK Pack ✓
706 OK Pack ✓
686 Handle mechanism Lever
605 OK Pack ✓
692 Handle mechanism Lever
656 OK Pack ✓
694 Handle mechanism Lever
579 OK Pack ✓
293 OK Pack ✓
584 OK Pack ✓
242 OK Pack ✓

647 Lord
621 Handle mechanism Lever
636 OK Pack ✓
709 Spring Return
583 OK Pack ✓
700 OK Pack ✓
642 OK Pack ✓
641 OK Pack ✓
615 OK Pack ✓
644 Wheeler
258 OK Pack ✓
687 OK Pack ✓
277 OK Pack ✓
286 Handle Lever Cover
224 OK Pack ✓
266 OK Pack ✓

617 Oil Pack ✓
619 Oil Pack ✓
679 Oil Pack ✓
682 Oil Pack ✓
695 Oil Pack ✓
2664 Bar Handle
690 Oil Pack ✓

206

665 Low
271 OK Pack
227 OK Pack
275 OK Pack
589 Low
225 Low handle bad
659 OK Pack
701 Low
606 OK Pack
712 OK Pack
686 OK Pack
697 OK spring
621 Low
647 Low
661 Low
272 OK Pack
646 Missing

207

639 Handle loose spring
671 OK Pack
669 bad transmitter spring
256 OK ~~Pack~~ spring
264 OK ~~Pack~~ spring
676 OK spring
690 OK spring
580 Low
280 OK Pack
621 Low
629 Low chalk + P.C.
657 Low
654 Low
6

208

-621- Low —
-665 O.K. Pack
-709 O.K. Pack
737 O.K. Pack
274 O.K. Pack
279 O.K. Pack
286 O.K. Pack
278 O.K. Pack
276 O.K. Pack
- [illegible] O.K. [illegible] Leaving week
- 273 - O.K. Pack —
- 283 O.K. Pack —
- 287 - O.K. Pack —
- 282 - O.K. Pack —
- 280 - O.K. Pack — Loose in
- 277 - O.K. Pack —
- 650 — O.K. Pack —
- 288 - O.K. Pack —
- 290 - O.K. Pack —

209

-29[illegible] - O.K. Pack
-811 - O.K. Pack —
-285 - O.K. Pack —
-291 - O.K. Pack —
-[illegible] O.K. Pack
-259 - O.K. Pack

-735- O.K. Pack —
-805- O.K. Pack —
-812- O.K. Pack —
-747- O.K. Pack — Spring
-750- O.K. Pack —
738- O.K. Pack —
808- O.K. Pack —
715- O.K. Pack —
-731- O.K. Pack —
-733- O.K. Pack —
-742- Low —
-700- Low —
-602- Low —
798- O.K. Pack —
269- O.K. Pack —
715- O.K. Pack — Spring —
-776- Low —
-722- O.K. Pack —
-800- Low —
784- Low, Bad Transmission & Spring

-800- Low —
-756- Low — Spring —
-741- O.K. Pack —
-621- Low —
-764- Low —
-755- O.K. Pack —
-866- Low —
-787- Low —
-776- O.K. Pack — Spring —
-619- Low —
-644- Low —
-784- O.K. Pack —
-790- Low —
-726- Low — Spring —
-759- O.K. Pack — Low
-250 O.K. Pack —
-770- Low —
-729- O.K. Pack —
-692- Low —
-813- O.K. Pack —
-796- Low —
-792- Low —
— continued

795- O.K. Pack, New Spring
746- Low-
739- Low-
629- Low-
654- Low-
814- O.K. Pack-
786- O.K. Pack-
753- Low-
816- O.K. Pack-
810- Low-
751- Low-
801- Low-
734- Low-
742- O.K. Pack-
725- Low-
722- O.K. Pack-
768- O.K. Pack-
773- O.K. Pack-
774- O.K. Pack-
825- Low-
778- Low-
727- O.K. Pack-
Note.
752- Weekly Edition for
last, [illegible] Thursday Jan

775- Wet on each side by
Edison, Tuesday, Morning
Dec 22 '17 at Wheeler
139. Bad Chair-

216

792- O.K. Pack
768- O.K. Pack -
648- O.K. Pack
745- O.K. Pack -
800- O.K. Pack -
735- Low
612- Low
644- O.K. Pack -
760- O.K. Pack
621- [illegible]
866- O.K. Pack -
639- Low -
787- Low
795- Low
728- O.K. Pack -
789- [illegible]
796- Low -
692- Low -
770- O.K. Pack
775- O.K. [illegible] Pack -
752- O.K. Pack -
759- O.K. Pack -
761- O.K. Pack -

13 Shipped

13

217

718- O.K. Pack -
755- Low
629- Low
781 O.K. Pack
684 O.K. Pack
225 O.K. Pack
801 O.K. Pack
734 O.K. Pack
725 O.K. Pack
746 O.K. Pack
754 Low
714 O.K. Pack
589 O.K. Pack
692 Put in Pack
759 O.K. Pack
724 O.K. Pack
[illegible] Low
756 Low
[illegible] Low
[illegible] Low

12 Shipped

218

790- O.K. Pack 13½ Gauge
793- O.K. Pack - Spring
7[illegible] - O.K. Pack -
629- O.K. Pack - Spring
692- O.K. Pack -
[illegible]- O.K. Pack -
775- O.K. Pack, Pivot -

7

219

[illegible]- O.K. Pack ✓
903- [illegible] O.K. Pack ✓
819- O.K. Pack - ✓
62[illegible] O.K. Pack ✓
7[illegible] Ruelite -
631- O.K. Pack - Spring ✓
662- O.K. Pack - ✓
755- O.K. Pack - ✓
756- O.K. Pack - ✓
793- O.K. Pack ✓
761- O.K. Pack ✓
87 O.K. Pack ✓
60 O.K. Pack ✓
21 O.K. Pack ✓

18

220

January 2 1840

6081 × C.K. Pack -
791 - 1 × C.K. Pack
714 - 1 × C.K. Pack -
788 - C.K. Pack -
639 × C.K. Pack -
736 - C.K. Pack. Shirting
769 - 1 × C.K. Pack -
778 - 1 × C.K. Pack -
726 - 1 × C.K. Pack -
750 - 1 × C.K. Pack.
804 - Wool - transmit -
756 - C.K. Pack. Sperm -

R 2 1

246 To Recorder

~~1367~~
Returned 998

250 Expts To Be Tried by J. Cayuse for S.T.A.

Expt not by J. L. R. 2.30.

6 balls soaked one minute each in [illegible] and allowed to dry [illegible] under a bell jar and then put under a bell jar and [illegible] as before. Results numbered (794) (891) (846) (926) (763) (753)

Expt No 3

[illegible] with one brush of dry water on [illegible] but [illegible] on the [illegible]. In trap No (817) (891) (816) (926) (612) (651) (726) (723)

Expts. to be tried 255

Wet 6 by soaking them 1 minute and then drying them [illegible] bell jar and [illegible] as soon as [illegible] Expt No 1

Expt No 2

[illegible] 15 hours [illegible] [illegible] [illegible]

256

261

890 to be cut ✓
878 to cut ✓
817 to cut ✓
846 to cut ✓
654 to fabricate ✓
807 to cut ✓
849 to cut ✓
157 to cut ✓

650
720
7

262

Eballs wet on both ends and not on the trash.

739
652

263

Chalks that wer low and wer wet a little more.

Experiments to be tried

Wet one in outside, without wetting the inside

Wet one without wetting the ends

225	600
610	621
664	
629	
778	
746	
770	
792	
992	
796	
768	
789	
728	
790	

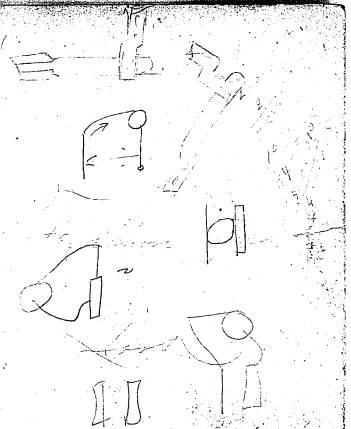
Rewet on ends but not on [illegible]

7241

200

Chalky wet by J.Q.
on the end and not on
the middle (1.17½)

799	
555	
899	E Freeland
886	E Freeland
831	
662	
599	D W Crane
913	
1	D Crane
850	D W Crane
851	
861	D W Crane



Menlo Park Notebook #87 [N-80-10-23]

The few dated entries in this notebook cover the period October 1880-January 1881. Most of the book was probably used in 1880. The entries are by Charles Batchelor and Francis Upton. Some of the entries are probably by Francis Jehl and other members of the laboratory staff. Most of the material relates to electric lighting. Included are notes on steam engines, belting, and dynamos; notes and drawings relating to electric power distribution; and notes on lamp experiments. There are also drawings of a telephone switchboard. The book contains 278 numbered pages.

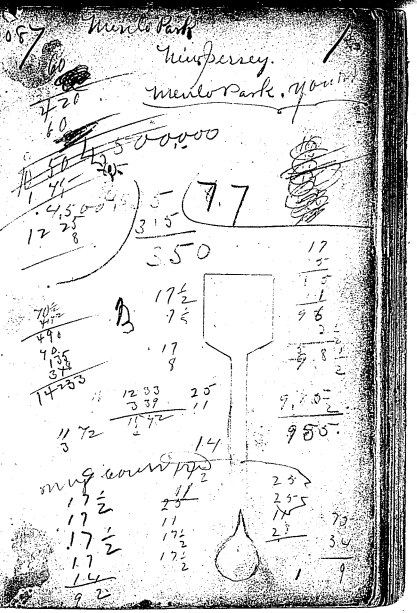
Blank pages not filmed: 14-19, 54-93, 106-201, 204-206, 209-258, 263.

Missing page numbers: 21-22, 197-198, 207-208, 241-242, 259-262, 265-268.

LIBRARY OF THE

BOARD OF PATENT CONTROL,

120 BROADWAY, NEW YORK.



Water pipe

1/4 Mile 8in Water pipe

(cast iron) 1575-00

laying Same 750-00

$2325.00

Saving in Condensing Engines

1200 HP Cond. Eng. allows a saving over a Non. Cond. Eng. of as much as pays interest on $50000 in coal alone

There is $9600 less invested in boilers —

Allows 1/3 less water for boilers —

Allows 1/3 less room for boilers

Allows 1/3 less depreciation in boilers

Allows a saving of $1460 in firemen per year

Allows a saving in rent

Against which must be put

on

Extra Cost of Cond. Eng over Non Cond. $8160.00

For 1200 HP boilers we should want 8000 ft condensing surface
Copper pipe for this $\frac{1}{32}$ thick $\frac{5}{8}$ hole takes 3200 ft long + 1250 ft for ends = 33250 ft =
12,350 lbs at 38¢ =
$4,704.41

Cost of piping, well etc for Cond. water to be figured hereafter.

Saving in boiler water by using condensor water over and over $\frac{2}{3}$ (Surface Cond.)

Cost of running Cond. Eng.
per hour per H.P.

Coal	·0031
Labour	·0013
Oil Waste &c	·00016
Rent	·0011
Labour doubled	·0013
	·00022
Water	·0005
Interest	·0014
Depreciation	·0011
	·00948

or about 1d per hour per H.P.

1000 revolutions.

10 / 12) 107 (8.33
96
33.3 2
633
2499
2.61 5 6 2
1/11

5" 5
5
275
2600
165 000
556
5000 (21.6
33) 71
66
55
33
220

2600
5
13000
65
10.8

Belting Rules

Belt running 2600 ft/pm
5 inches wide

Page IX

Each inch of width of good belting will transmit a force of 5·5 lbs on large pulleys. 21.6 H.P

Page XIII

$t = c \frac{H}{v}$ or $H = \frac{tv}{c}$

t = breath in inches
H = horse power
v = the speed of the belt in feet
c = a constant =
= 26 for upright shafts
= 20 " horizontal "

10.8 horse power
Large pulley

10

Lizzie 1/4

6 in pkd

4.33

5

2165

Oct.

9 o'clock Speed 520 ft. per minute

10 " " 510 " "

11 " " " "

12 " " " "

Page 17 11

Ordinary leather belting one inch wide having a velocity of 600 ft per will transmit one H.P.

21.65 Horse Power.

12

Incandescing Arc
Shut 1 Fig 8
Konn Brit Patent
3809 1872

Get D'Incandescence
U. S. Patent
114,655
probably multiple arc

Harrison
Brit. Pat. 1858
No 1099
Bottom page 5

13

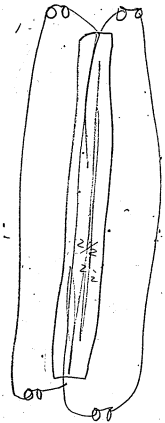
Incandescing arc
Carbon Battery
Trouvé

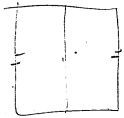
Du Moncel applications
Vol V p 637

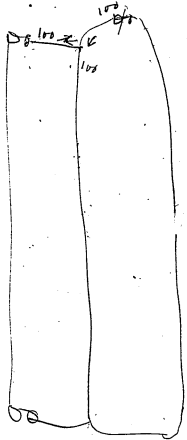
Multiple arc & fuses
Tel Journal 1873. page

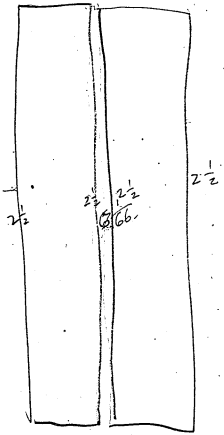
32

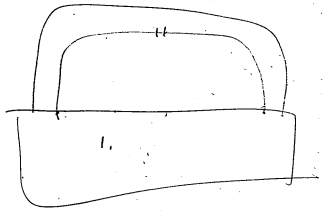
Multiple arc & Shunting
serial lamps
Tel Jnl. 1873. page 43








2½
2½
2½
2½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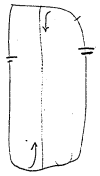


Connect Dynamo room
with line to laboratory and
Upton's house 4 wire
on insulators outside of
machine shop. Two lines
for exciting machine.
~~Five lines~~ 6 lines.

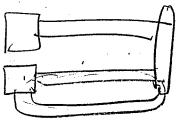
2 Machines for power in
shop

2 Machines for light in
shop

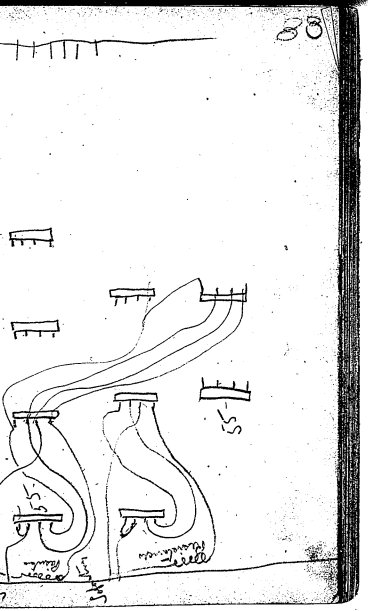
.55 Ohms
~~5~~ 3 machines on line to
Upton's house

3 machines on laboratory
11 line on 1.55 Ohm Machines
amt. railroad

1. Exciter.



Engine Room



37

On hand

Lewis .14
Lee .14

2 here
1 nearly

here

over .5.5

5.5

5 machines running in [illegible]
3 outside
8 machines

3 machines .14 on footing for power

1 machine .5.5 for light for footing

2 machines 5.5 for running lamps in laboratory and if another .5.5 armature is not finished
2 .14 ohm

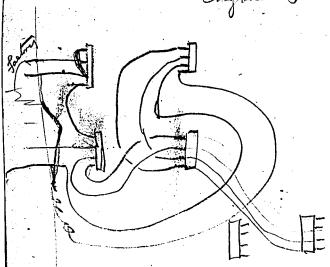
3 machines with magnets to table for experimental and R.R.

1 Exciter

Jr. ship

36

Engine Room



Circuits underground

R.R. 6 strands

R.R ave 6 strands

17. 8 strands S.E.

18 8 strands N.W.

25 8 strands Cannon

Overhead

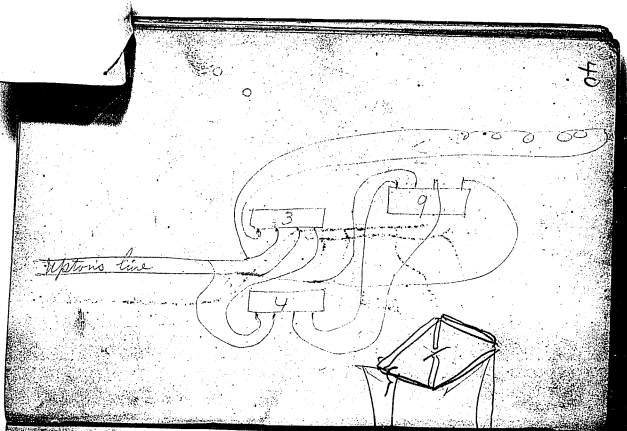
Upton

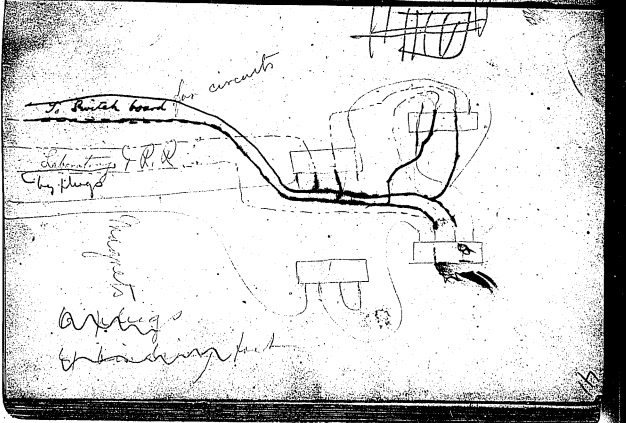
Laboratory

Magnets

& galvanometer

1871
535
1711


3
9
Hipton's line


for circuits
Switch board
Adjustment
Key plug
9

Plugs Laboratory
Upturn line

Large binding post Magnet
small for galva.

R. R. line to be carried
to left hand of switch
temporally with plugs.

44

Ketchum Dynamo

Rev 1380.

66.15 V at machine

at machine with lamps

64.13.

At the commencing of lamps 61.13

end of lamps. 45.9

Other Dynamo.

Rev 1020

Field 85 V.

4 with Blues.

Ketchum Dynamo

1340.

~~[illegible]~~ = 52.65 Volts at the first lamp.

Candels from lamp across the line 1.8.

5.1.3 at the end of the lamps

55

Brought the lamps to eight candles. Lamp was marked 52 volts.

Brought the lamp to about eight candles. They were all whose electro motive was about 52 volts.

Ten lamps off brought it up to 9 C.P.

twenty lamps off it gave 11 candles

Thirty lamps off it gave 13 candles

fourty lamps off 16.5 Candles

48

~~fifty~~ Lamps off
22.5 Candles

Sixty off
26.5 Candles

32 Lamps with about
2.3 ohms in gives 8 C

68 lamps, at 8 with
14 ohms.

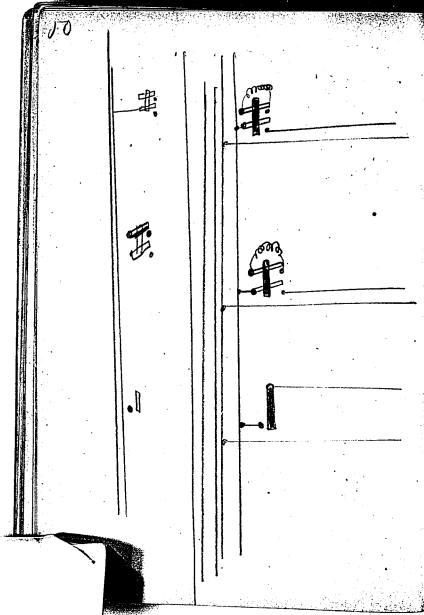
98 lamp at 8 candles
with 6 ohms

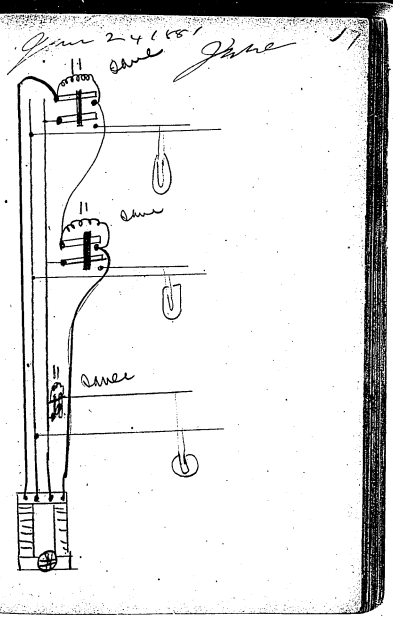
~~100 ohms~~

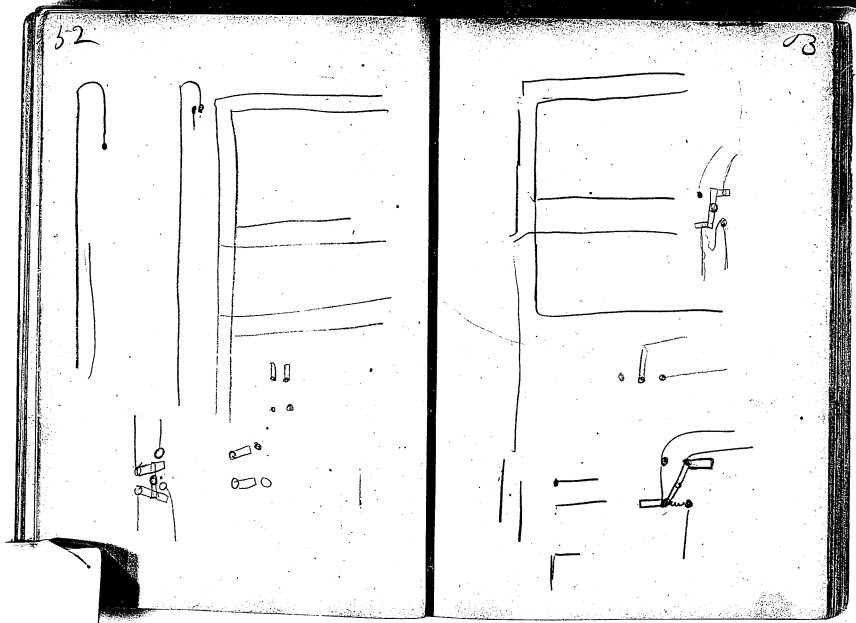
98 lamps 10 C with 3
ohms.

49

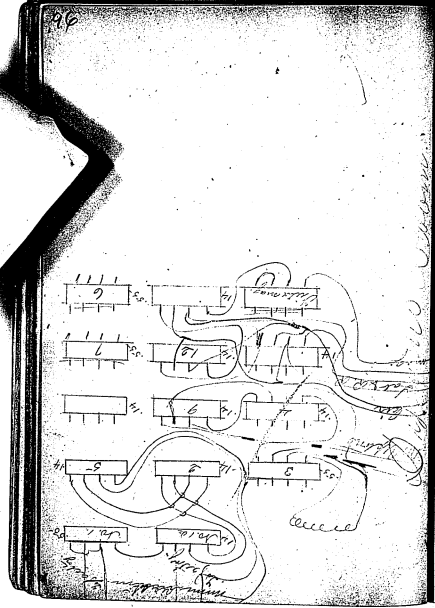
Without any resistance
give 11 C ms

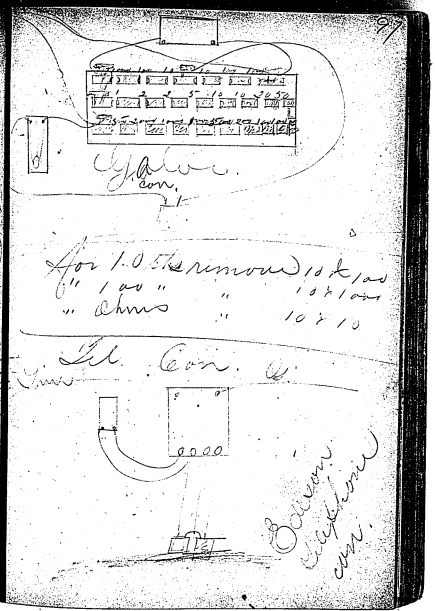


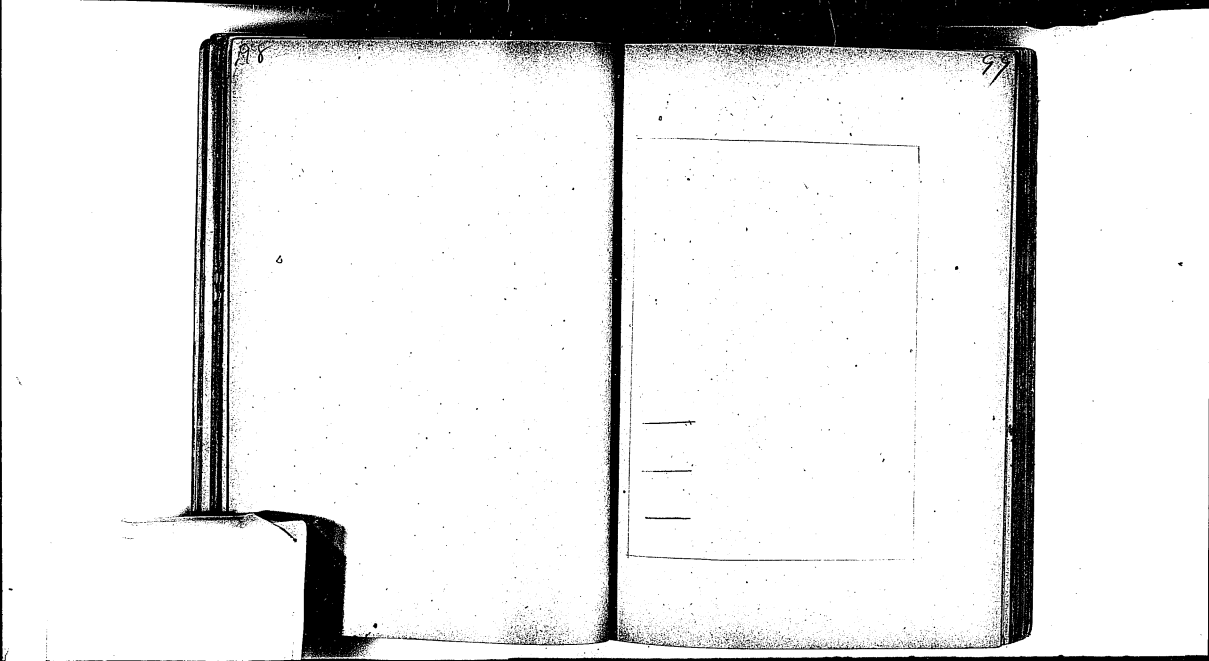




for tenths 10 x 10 sq
" Tav 10 x 10 sq
" 0's. 10 x 10




for 1.0 Ω remove 10 Ω/cm
" 100 " " 10 Ω/cm
" ohms " 10 Ω/cm
Tel. Con.
Balcony Switchboard Conn.



100 Directions for Attaching and using Water's Patent Engine Governor. In taking the Governor apart for the purpose of attaching the Valve Chamber to the Engine, the Top should be lifted off as true as possible so as not to spring or bend the Valve Stem.

101

1 13

1030)1365(1
1030
335

Speed of Disc Engine (Westa).

Oct. 23, 1880.

		Boiler Press.
9 P. M.	Speed 520	
10 P. M.	" 510	
11 "	"	
12 "	"	

Oct. 24, 1880.

		Boiler Pressure.
9 A. M.	Speed 500	
10 "	504	40

Dyanmo No 11

Magnets. 150 + 15 = 165

Magnets = 1.60 ohms

Armature .20 - .05.5 = .14.5

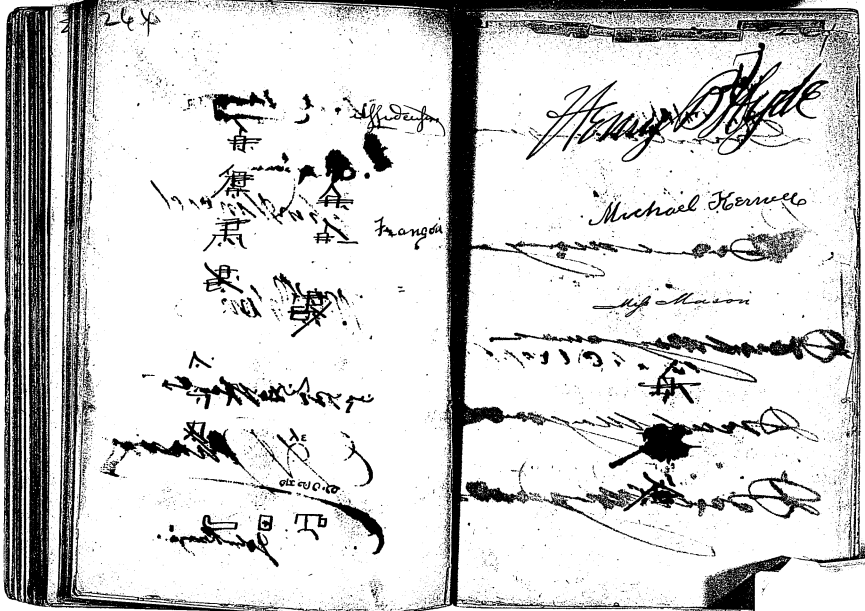
~~1.6 5 = 1.47 ohms~~

Dyanmo No 14

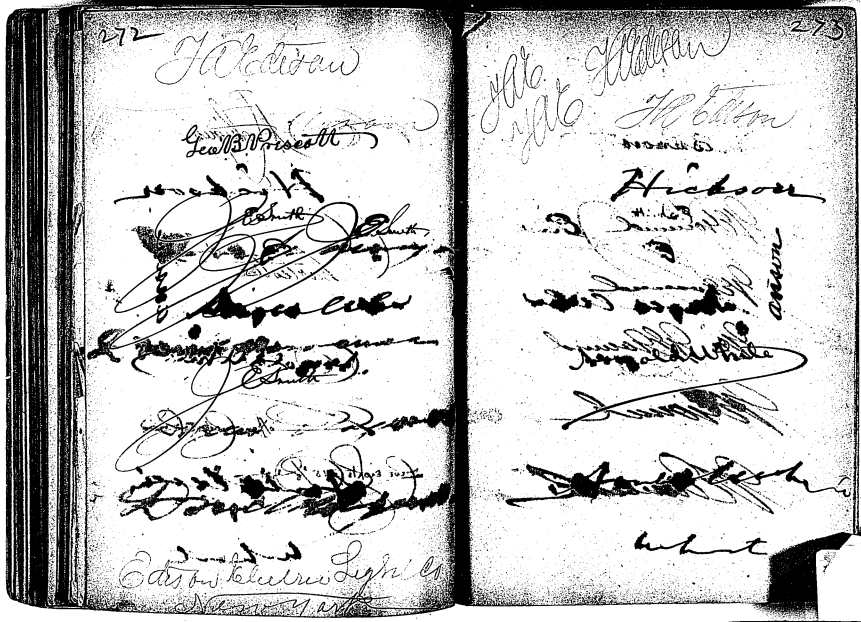
Armature .14 ohms

Magnet 1.47 ohms.

Bar. Tithes of Lead
Pur. Vac. V. 37


Michael Kerwell

Michigan
Charleston


272
273
Hickson

274

anson

1422

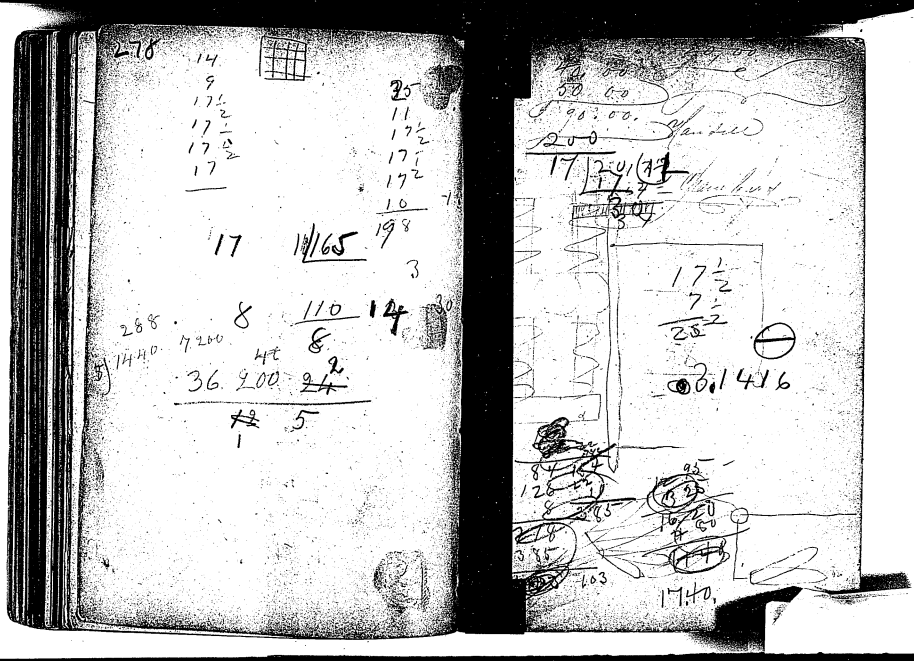
275

CM 7 224

~~A bright spot near~~
~~the centre~~
One side appeared to be
a great deal brighter
than the other.
At 17 C 15 ft

276 No 1409

Very bad spots all
over without
any Res at was
12.5 C



Menlo Park Notebook #88 [N-79-08-28]

This notebook covers the period January 1880-January 1881. Most of the entries are by Albert B. Herrick. There are also a few entries by other laboratory assistants. The first part of the book contains a record of street lamps at Menlo Park during January 1880. Following this are many pages of miscellaneous calculations along with a few drawings of lamps, generators, and other devices; notes on chalk cylinders; and drawings and dimensions of a Porter-Allen high-speed engine. There are also three draft letters by Herrick, two relating to telephone orders and installations and one about a vacuum pump order. The label on the front cover is marked "Herrick." The first page is inscribed: "Sworn in Evidence Ashcroft - Justice Peace NY City." The book contains 282 numbered pages and has been used in both directions. The pagination is irregular; some numbers are used for more than one page.

Filming order: pp. 1-243, 282-260 [in reverse page-number order].

Blank pages not filmed: 172-173, 176-177, 184-185, 218-233, 238-241, 244-259.

Missing page numbers: 201-202, 247-248.

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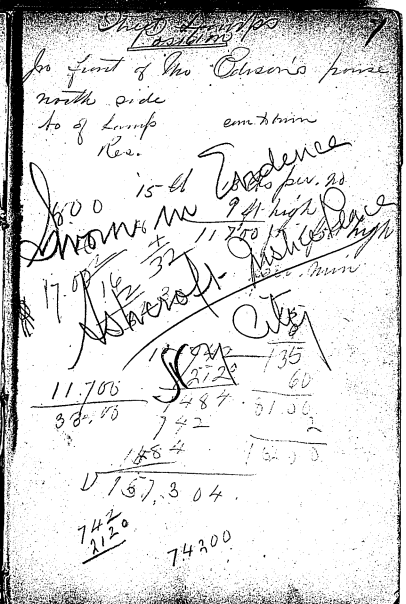
GENERAL ELECTRIC.

_____, 189_.



2

$794 : 1 :: 19X$

$19 \overline{)794} \left(41\tfrac{15}{19}\right.$

76

34

19

15

$795 - 1/2 C.$

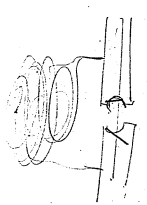
$795 - 1/2 \text{ of } \frac{1}{795 - H}$

$\frac{1}{1590}$

3180

For front of Edisons
House south side
No of Lamp
Res.

cons & town



No Lamp-post at corner of
Mr Edisons yard

No of Lamps conn. to Sum
Res

Ground 5 to in circumf end
Iron post- rises to end of stock
to 5.25 in

Total length 20 in + Thickness
of Clay

Opposite Mrs Baldwins
House Lamp-post Ann & Bonn
No of Lamp
Res.

Jon Street Lamps Below 8

Mrs Jordans

Roof Lamps

Ken.

Jean Hamm

9

Jas Lamsfasit by Adams 18

Ato of Lumb Rec

Con Sum

66 × 66 = 396 + 396 = 4356

50 × 56 = 14 × 14 = 196 + 196 = 1960

196 / 4356 (22 × 2 = 44 22/49)

392

436

392

44 11/49

196

Start Jump: month ends 2

Office

No of Jumps Nos

Cam. & Comm

H.W. 1c ... high ... height to 1.05m

L.H.W. 24

L.K.W.S. 3.5

length from 6.91

height - jump from track

width ... & ...

Ride ... 6/20

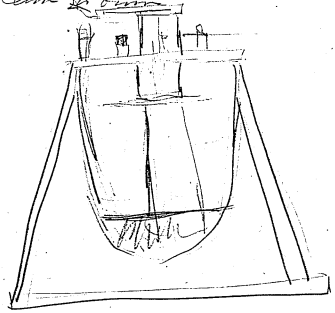
Size ... 2

... height -

length

Ref

Street-Lamp Oonth oilly
Office
Pos of Lamp Res.
Cem 4 bum



Agents Benjamin

14

Of

Interpolation

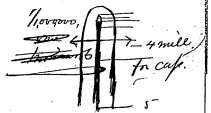
Inversely

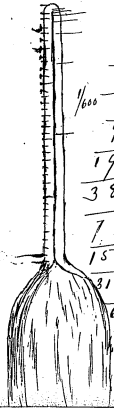
4185-4800
4185-0007
479.3 Tot diff
between
Inner and Major
axes

Worked

Street-Lamps between Lab. and Office

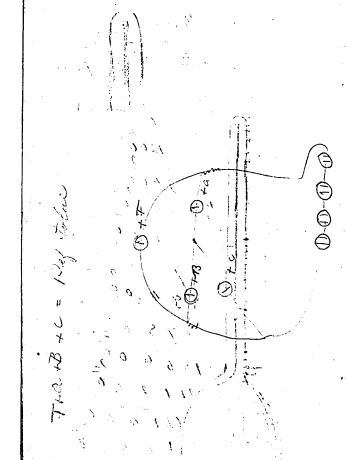
As of Lamps Rev.





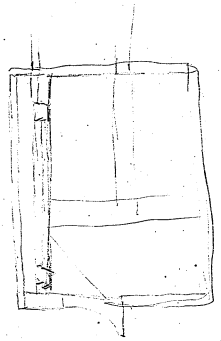
600
1200
2400
4800
9600
19200
38400
77800
155600
311200
622400
1244800

6

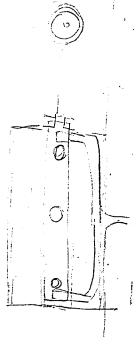


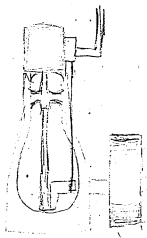
7

Street Lamps between
Lab. and Phys
No 8 Lamps Res.
Commenced 8 hours



Sheet-Lamp of copper
for marine Ships
Etc. Lamps &c.
Cerm. to burn





Sheet – Lamps at Corner
of Lab. Yard
No. of Lamps
Corn. Burned

Nobody's
you are a stab
you cannot
Buried under stairs
I shall see

Foot of stairs May 28 1880

22

x = first No 5

$4x$ = second No 20

$3x = 15$ third No 15

$6x$ = fourth No 30

$x + 4x + 3x + 6x = 70$

$14x = 70$

$x = 5$

x = eldest 15

$4x$ = [illegible] 60

$x + 4x = 75$

$5x = 75$

$x = 15$

Street lamps between corner 30
and Cab. guided

No of Lamps Res.

Case to learn

x = first-fourth 12

$2x$ = second " 24

$3x - 15 =$ third " 24

$x + 2x + 3x - 15 = 57$

$x + 2x + 3x = 57 + 15$ 36 / 15 / 21

$6x = 72$

$x = 12$

---

x = eldest-[illegible] left- after 1-
$x - 3$ eldest left after 1 tav.
$\frac{1}{3}(x - 3 - 9)$ " " " 2 "
$x - 3$ [illegible]

$3x - 9 - 27 = x$ 12 / 9 / 3

$x + 3 + x - 9 = x$ $x = 15$

$x + x - x = +3 + 3 + 9$

24

$10x = 20$

$\frac{x}{5} - \frac{x}{2} = 3$ $\qquad$ $\frac{x}{2} - \frac{x}{5} = 3$

$x - x = 30$

~~$x = 30$~~

x

$5x - 2x = 3$

$3x = 3$

$x = 1$ $\qquad$ 10 and 5 = 2

$\frac{16x^2 \div}{8x}$

$8x \overline{)16x^2} \; (2x$

$-12a^2x \overline{)36a^3x^2} \; (-3a^1x$

$36a^3x$

~~$0 = 8a \quad 36 =$~~

At corner of Plank Walk.

At ~~4~~ Jump Res.

Commenced to run. Res.

x = Lemons

y = oranges

$x = y$ $\qquad$ $x = 2$

2 $\qquad$ 2×2

$2x + 3x = 80$

$5x = 80$

$x = \frac{16}{10}$ of each

32

28

160

74

800 cents

26

$29a^2b^4c^6 - 58a^3b^3c^2d^2 - 2ab^2cd^2$

$\frac{x+a}{6} - \frac{c}{d}$

$\frac{dx+da}{6d} - \frac{cd}{6d}$

$dx + da - cd =$

$= 2dx a - cd$

$\frac{3x+a}{5} - \frac{2x+y}{8}$

$\frac{24x+8a}{40} - \frac{10x+35}{40}$

$24x+8a - 10x+35$

40

Jno Lamb-post between Thomas's Stable and corner of walk etc of Lamb. Res Com. & Guild

4

$24x$ = days worked

$-12x$ = days idle

$24x - 12 = 504$

x = days work

y = Idle days

$x + y = 504$

$24x$ = what he earned for

$12y$ = what he paid for

$24x + 12y = 504$

$x + y = 48$

28

$24x = 504 - 12y$

$y = 48 - x$

$24 \overline{)504} \; (21$
48
24
24

$12y = 504 + 24$

$12 \overline{)482} \; (41/4$
48
2

29

Steel-Lamp instrument of
Thomwalts Stable
No of Lamps Rec.
Com. Dollars

Wyoming.

Geo Carman

Utah

Sa Edison

From Cat

30 474

Gen

An effect is caused along the nerves at the rate of 93 feet per second

3830 6207 3076
7066 5402 574
6676 6204 7063
7078 3460 7843
3076 3820 4764
3375 3988 4304
4067 2490 401
4076 5366 47644
9870 3208 232
4780 3760 3207
3176 3436
5687 5876
3264 5876
3220 5876
3824 3490

Street Lamps by aptera 31

Number of Lamps

Cum Number

Nos.
4240
3220
3067
3268
3280
3200

Steel-Lamps at corner
of Boston Jane
No of Lamps 739 Nos. 1144
Commenced burning Feb. 26
1880
Miami 6186 St. Louis

3.4

176

$36a^4b^6c^8$

$-2a^4b^4c^6d \;/\; 144a^9b^8c^7d^5 \;(-4a^5b^4c^4d^4$
$144a^9b^6c^7d$

$-4a^4y^3 \;/\; 12a^4y^6 - 16a^5y^5 + 20a^6y^4 - 28a^7y^3 \;(3y^3 - 4ay^2 + 5a^2y - 7a^3$
$12a^4y^6$
$-16a^5y^5 + 20a^6y^4 - 28a^7y^3$
$-3y^3 + 4ay^2 - 5a^2y + 7a^3$

$6ax^6 + 6axy^6 + 42a^2x^2 \;/\; ax + 7ax$
$6ax^6$
$6x^5$

Steel Lamp south side

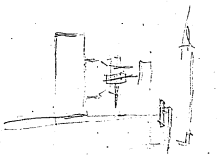
Up Down Left Right

No of Lamps 5/3 Pcs

Conv. & turns

7+4.3 12

3 2 2



$6ax^6 + 5ax^6y^6 + 2a^2x^2 \;/\; ax + 5ax$
$5ax^6$ $5ax^6$
x^5

June 16 1880

Entrance Turnin

4

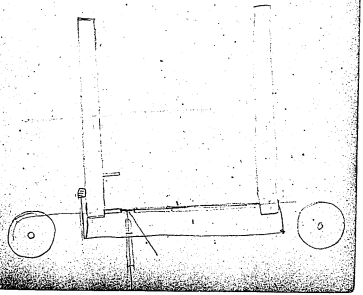
Steel Lamp north side 87

top of Stairs to Chapel —

No. of Lamps 352 Res. 122

Com. Burning Lamps June 10. 1880

broke March 5. 930 hours



38

39

If you cannot-
talk united States
idems and shake
hands you
he will right speak
to you

Yat

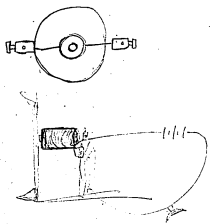
Obama shake hands

Texas
everybody knows
your pet name

début sample du ~~Prélèvement~~ dentier

to

base



67 19

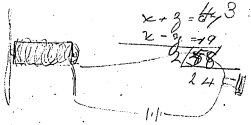
x = 43
y = 24

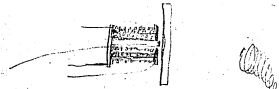
x + y = 67
x + 19 = 19
2 2 18 6

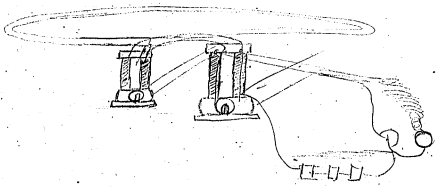
x + y = 67
x - y = 19
2 2 48
24

67
43
24
48

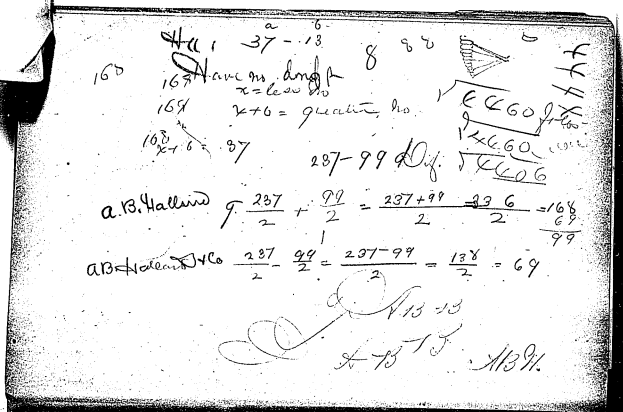
67
24
43
2

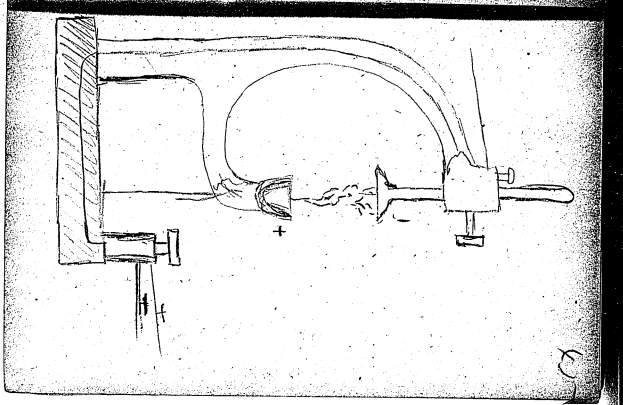






Two Engines 40 20
1 Engine of combine 1/8 inch thick
One Engine 1/16 inch thick


a
b
37 - 13
x = less no
x+6 = greater no
x+6 = 37
237 - 99
a.B. Halleck
237/2 + 99/2 = 237+99/2 - 99 6/2 = 168/2 = 84
99
a B Halleck & Co
237/2 - 99/2 = 237-99/2 = 138/2 = 69
A13-13
A-13-13
A1391.


+
-

22 Inches metres long
2 millimetres dia.
26.° Centigrade

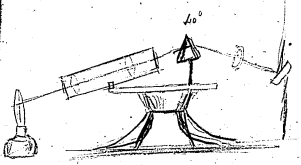
$7a^2b - 9ab^2c - 9a^2b^2 - 9ab^2c + 3c^2 + 9d^2$
$-5a^2b^2 + 8ab^2c - 4b^2c + 3c^2 + 2d^2$
$4ab^2 - 5a^2b^2 + 9b^2c$

$6ab^2 - 9abc - 3b^2c$

3 a .0127 Inches
22
0254
0254
.279400

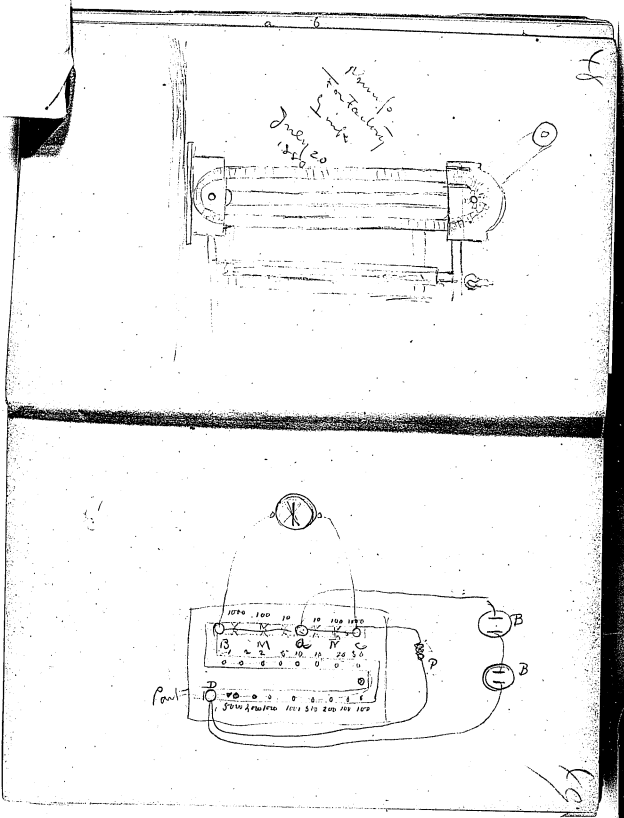
4 inches

.06988 Res
0998
.06565 Things
.0038
26
0228
0076
14.07538



60 feet
32
28

$51a^3b^2c - 18abc - 14a^2y$
$41a^3b^2c - 27abc - 14a^2y$
$10a^3b^2 \quad 9abc$
$5a^2 \quad 1$



$5a^4 - 7a^3b^2 - 3c^5d^2 + 7d$
$3a^4 - 9c^2 - 7c^5d^2 - 5b^5 - 3a^2$
$-15a^3b^2$

$2a^4 + 8a^3b^2 + 4c^5a^2 + 7d + 9c^2$

cm.

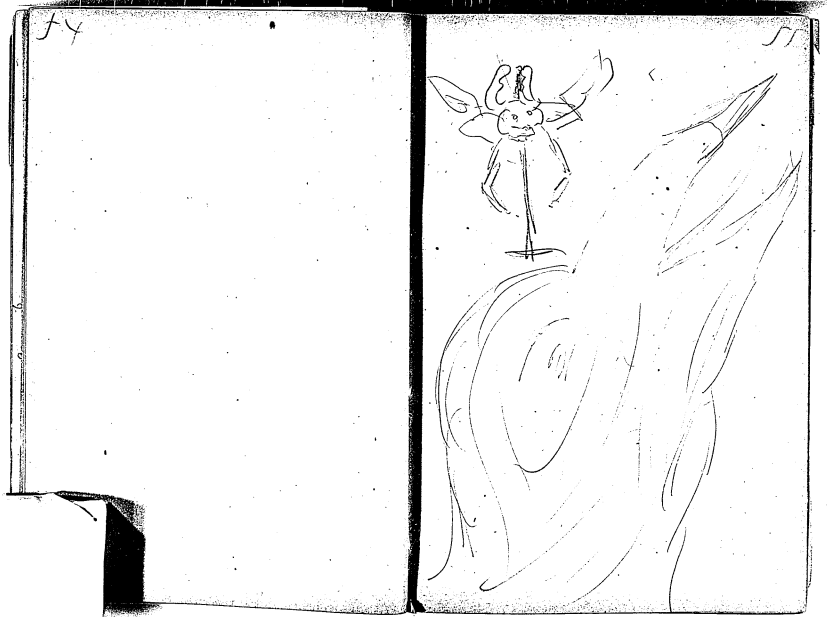
Semi merke Lagnes
Brue ~~corrthus~~
$= dac = 12$
2ue.

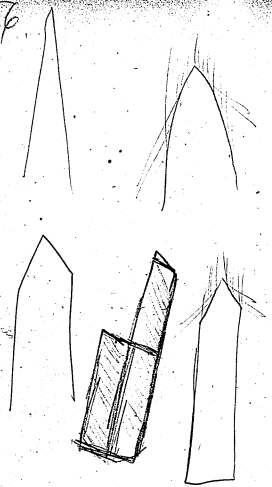
$2a^2 - 3ax + 4x^2$
$5a^2 - 6ax - 2x^2$
$+10a^4 - 15a^3x + 20a^2x^2$
$-12a^3x + 18a^2x^2 - 24ax^3$
$+4a^2x^2 + 6ax^3$

$= 10a^4 - 27a^3x + 24a^2x^2 - 18ax^3$

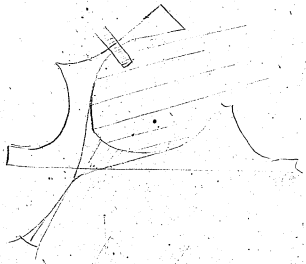
12

13





March 18. 1880 27



58

59

Precis

61

4282

2.68.1442

5.262085

888.7 — 42.24

2,948755

1,625724

1.323031

30
31 10 6
30
61
0

1,81

106. Fatma

1025306 — 20 — 506120

Ismail

2.846

45-482

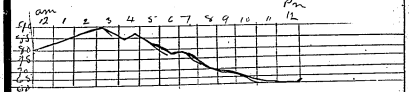
2070

60

61

105
.025306
.0126530

.00126530



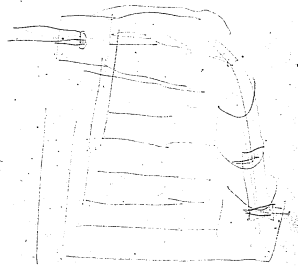
June
July 12 1806
Variation for 12 hours

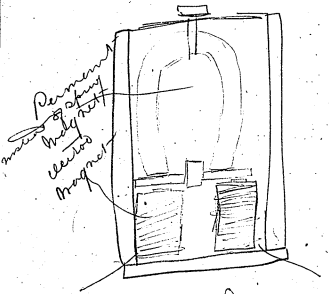
62

2 pair socks	1.00
1 pair shoes	2.50
1 pair suspenders	.75
2 pair drawers	1.50
1 undershirt	.25
pair Thermometer	.35
for papers	~~.20~~
for Soda Water	.25
	7.10
	.75
	8.55

10.00
7.70
2.30

10.00
8.55
1.45

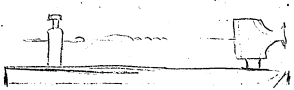


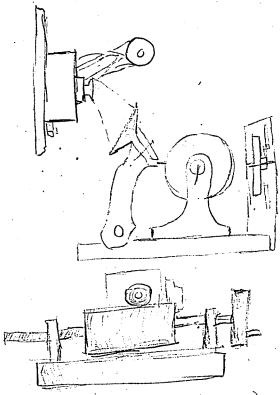


Patented by Johnson
June 1865

O.K.

Platinum wire .001 thick to wiring





Phonograph and connection with Long speaking telephone

70

45·2789

655·810
77
9
655896 kof.

3 5 3 8 6 7 2 3.345678
5574
78
88
1.0

1·9946455 98.7655
4551
24
22
2.6 Dog

6·345670
5·570
1·05
.22165

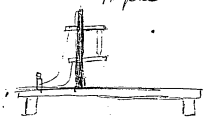
108
98
240
5

3·538672
8574
98 345678 5

1.647817
7774
42
94
1.40

12

73



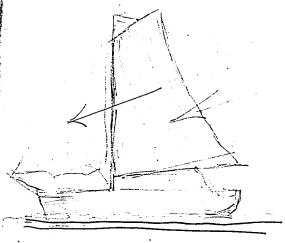
Microphone

Hammer head
amorphous

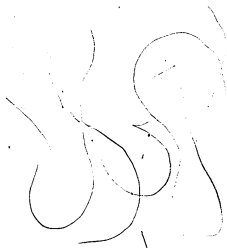
Printed Circuit

74

71

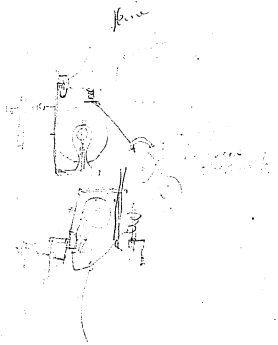


Tattoo in Progress



height	heavy
Onlooker 1	Artist 3
Artist 1	Artist 3
Artist 2	Artist 3

Helpful for participating



80

9.73345

668190

9.05387

6ac + 5a[illegible]

3cc + 2[illegible]

5ac − 5[illegible] − 7c + 4c²

− c

− 7c + 4ac

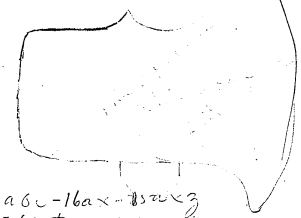
16a² − 56c + 7ac

− 14a² − 5c + 4ac

2a² − 7c + 11ac

81

1/4



19abc − 16ax − 85xz

− 17abc + 7ax + 15xz

2abc − 23ax + 100xz

84

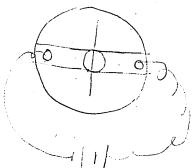
21

63

64 49

47

1

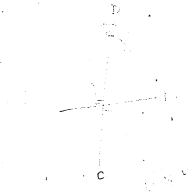


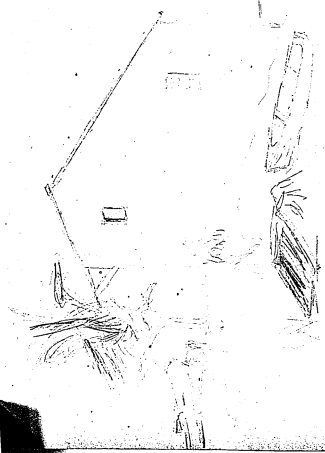
Bubble between two plates

[illegible] of water

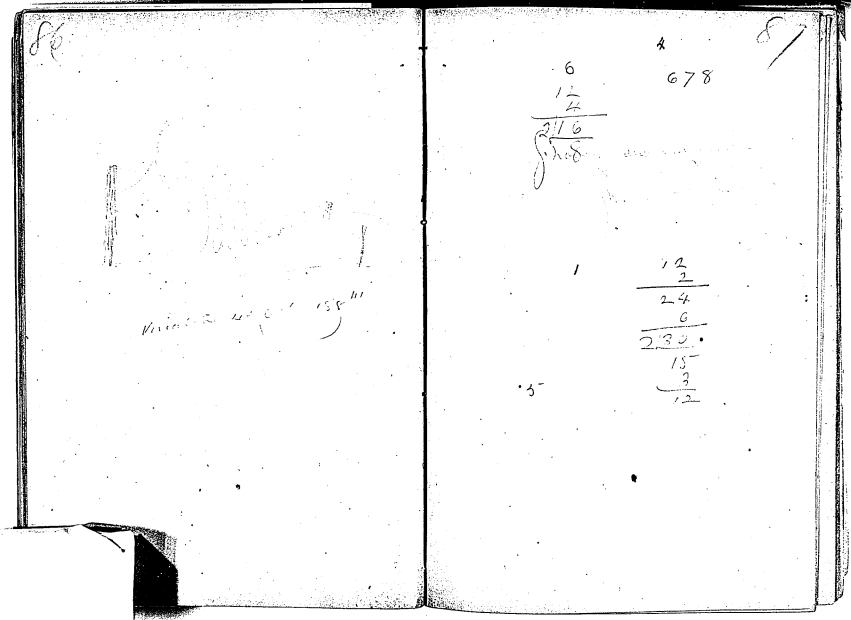
Broda also found between parallel plane as the resistance would increase and diminish with lengthening and shortening of [illegible] of water as cross section is reduced

experiment did not succeed under [illegible]





63
19
19
57
6
6



86

$\frac{x}{2}$ = Three orbs of Pearls

$\frac{x}{4}$ = " " 1200.

$\frac{x}{7}$ = Guinea

3 = Yearly

$\frac{x}{2} + \frac{x}{4} + \frac{x}{7} + 3 = x$

$2x +$

$54x + 168 = 56x$

$56x - 54x = -168$ $6x = 168$

28

14 8/3
12 1/3

14

12	12	
1	1	
13	13	6
5-	5-	
65	65	5
7	35	30
72	5-	
8		12
80	1/2	3
2	144	86
160	1	1
1	145	87
161	5-	3
5-	725	111
805		12
		123

678

59

90

91

4.370143

R85-5

R3450 Wan

1. 53,857 4

53 345-5

4.36.8999

4.33.36 8999
8277
122

98

6.345.678
5-120
109
22106

92

9.05585 19

9.68 3 7 / 2

16
17
98

93

2.5 3 8 6 7 2

8 8 9 4

345-98

8699
8672
27

845.6 / 2

1.9944605
4685
24

22165

9876

5.84

36
23
13

27
22

16
12
2|28
14
8
6

24
3
72
1
73
3
219
2K
243

8

16
77

1

12 14

13
2
26
8
234
17

12 8
24 16
8 8
2|192 24
16 12
4 4
12 8

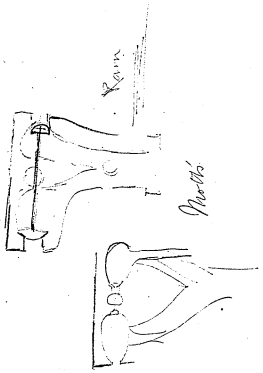
96

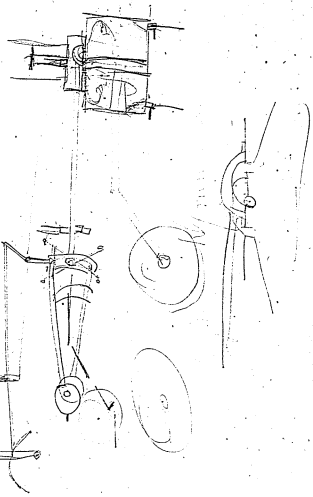
97

1

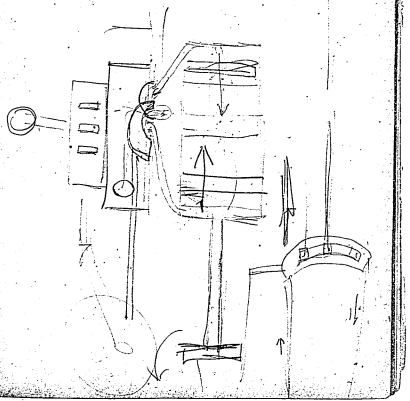
202
2
404
12
2 | 408
196
8
190

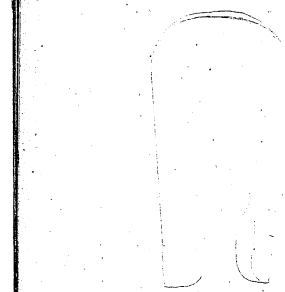
416
208
206
200

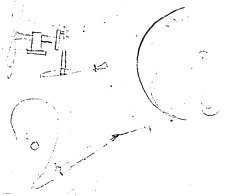

Rein
Mantle



Bonnet- hinge







Practice work

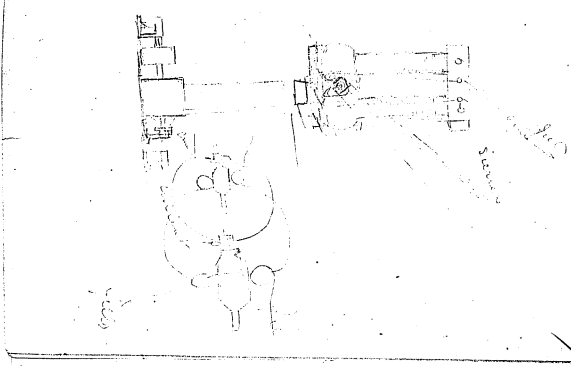
Armature coil w^R w^L

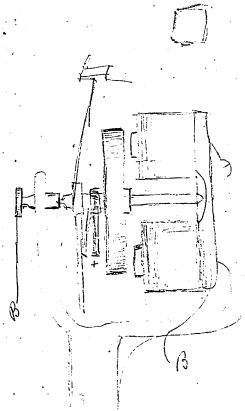
Field coils m^L m^R

$w^R + w^L$ = [illegible]

$w^R + w^R$ = [illegible]

$m^L + m^R$ from field
Drawing [illegible] magnetism field around $m^R + m^L$





105000

x = 5 %

y = 4 %

x

105000

5x/100 = 4y/100

5x/100 = 4y/100 = 4500

x : y ::

5x/100 : 4y/100 :: 4500 : 0

5x : 4y :: 4500 : 0

5x = 4y = 450000

x = 450000/120

Machinery

Steam cutting Cabinet & Scroll saw

One steam engine & boiler

1000.

Bussess Business

~~Dust~~

Index machine for gears

Microphone Telephone

Phonograph & Microphone

Bell Press & Table

Book cutting machinery

Pump

Steam Pump

Machinery Foundry

Portable engine and

Speedometer

Glass Tubes

Good

Good for Tuesday evening

Tremen.

~~Try one of the experiments~~

~~to-day~~ ~~if~~ ~~you~~ ~~can~~ ~~you~~ ~~can~~

~~Saturday night~~

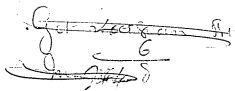
~~Can you come~~

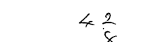
~~can come~~

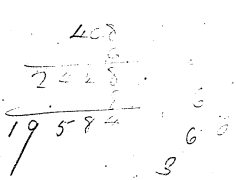
Fatima T.A.L Sup

$12345 \times 6789 = 45$

Cyclic no





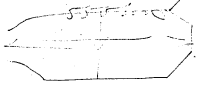


Grade

90'8 — 40'6 x

5-5 Beam

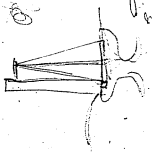
Camel back Trs. Ends



Many one Thick

Johannesburg

Dolomite



10.5 miles Jasmine

620

10.5

5 2 800
2640

624 | 5 5 4 4 0 (88)
4 9 6
5 8 4
5 8 8
88
62
25
62

8 90 cords
2.00
180.00

3 1/2
15
10 1/2
40
640
20
600
8
5 2 0 0
2 6 0 5

Experimental apparatus
all kinds of Laboratory
apparatus

Private telephone
lines erected and put-
in working order at
least cost price

11.13 Electrical Engineer

Burgess Power Co.

Roselle

J. G.

4
2440
4
90 | 10566
11
3
451

45 1
180
40

20
20
40

671.40

$x + 19$ = greater

$2x + 19$ = sum

sum = 67

$2x + 19 = 67$

$2x = 67 - 19$

$2x = 48$

$x = 24$

If the sum of two nos. & their diff. is known the greater no. can be found by adding ½ of the diff. to the less no. & the less no + 19 = greater no.

$x + 19 = 24 + 19 = 43$

$43 + 24 = 67$

$43 - 24 = 19$

$a + \quad - \quad b$

$7abc^2 - abc^2$

$-7abc^2 - 8abc^2$

$+6abc^2$

$-8abc^2$ ans

x = first no

y = second no

$x + y = 67$

$x - y = 19$

$2x = 86$

$x = 19 + y$

$x = \frac{19 + y}{1}$

$x = 43$

$x + y = 67$

$x - y = 19$

$2y = 48$

$y = 24$

$x = 67 - 24$

43

$x = 43$

$y = 24$

67

$x + y = 67$

$x + 24 = 67$

$x = 67 - 24$

$x = 43$

$y = 24$

122

x = original number he used at first

$\frac{x}{4}+3$

$\frac{x-\frac{x}{4}+3}{3}=12$

$\left(x-\frac{x}{4}+3\right)\frac{1}{3}$

$12x-(3x+12)=144$

$\frac{\frac{x}{4}+3-\frac{x}{4}+3}{3}=12$

$\frac{3x}{4}+9-\frac{x}{4}+3=36$

$3x+36-x+12=144$

$3x-x=144-36-12$

48

$x-\frac{x}{4}+3$

$\frac{x-\frac{x}{4}\times 3}{3}=12$

$3x-\frac{x}{4}+3=36$

$12x-x-12=144$

$11x=132$

$x-\left(\frac{3x}{4}+3\right)=12$

$3x-\frac{3x}{4}+3=36$

$\frac{15}{3}$

$\frac{18}{6}$

$6:18$

8

2

12

4

$x-\frac{x}{4}+3$

$x-\frac{x}{4}+3$

$x-\frac{\frac{x}{4}+3}{3}=$

$x-\frac{x}{4}$

$\frac{3x}{4}+3$

$x-\frac{\frac{3x}{4}+3}{3}=12$

$\frac{3x}{4}\div\frac{2}{3}=36$

123

y = greater no

x = less no

$\frac{y+x}{2}+\frac{x-y}{2}=y$

$\frac{x+y}{2}-\frac{x-y}{2}=x$

$y+x+y=2y$

$x+y-x-y=2x$

$2x=2y-y+y$

$2x=2y$

$y+x=y$

$y+y=x$

$x+y=y$

$2x+y=2y$

$2x=2y-y$

188

$x=94$

$x+y=$

$64+y=137$

$y=188$

64

188 ans.

$x-\left(\frac{3x}{4}+3\right)=12$

$3x-\left(\frac{3x}{4}\right)+9=36$

$12x-3x+36=144$

$y-\left(\frac{3x}{4}+3\right)=12$

$12x-3x-36=144$

$9x=180$

$x=20$ ans

Mear Sir

Receives yours
21. & must and made a
rough calculation on your
proposition which ariles and:
to £671.42 every thing in
working order The Lunes
Sems yours ~~[illegible]~~.

Yours
A.B Furnell
Esqr
Rosetta Mg.

Giving views for working
Ann: Wapish Mr. Mitchel-
which will work that drobing

$7x + 3ab + 2c$
$-3x + 3ab - 5c$
$5x - 9ab - 9c$

$9x - 3ab - 12c$

$16a^2b^2 + bc - 2abc$
$-4a^2b^2 - 9bc + 6abc$
$-9a^2b^2 + 6bc + 4abc$

$3a^2b^2 - 7bc + 5abc$

$2a + ab + ab = 3b$

$\cancel{5ab} + \cancel{\quad} + a - 3 + x$

128

14 stocks at Rs 15/-

800

(800) 4 : 4 (1

4200

7

6

@ 14 and 6 [illegible]

[illegible]

[illegible]

14

10 75 [illegible]

30 [illegible]

5-8 [illegible]

129

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

D = 40"

M = 75 Rs

Dia. 40" = 1.66

40" = 3.14 × 40 = 125.60

P = 3.14 × 40 / 75 = 75 / 125.60 (1.66

75 / 9420 (

75 / 192

75

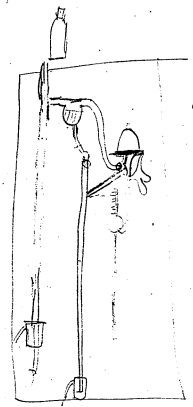
450

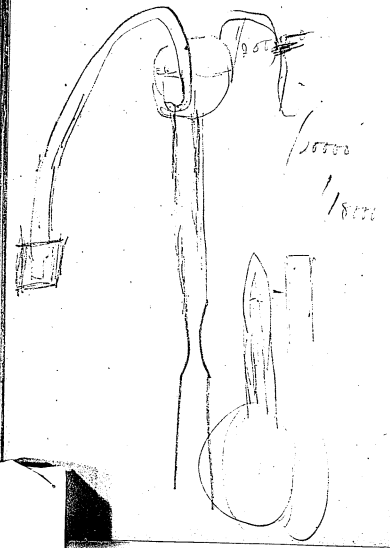
450

00

450

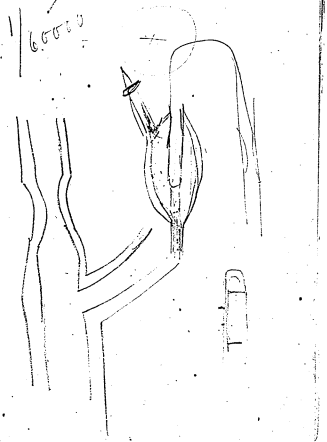
Lamp





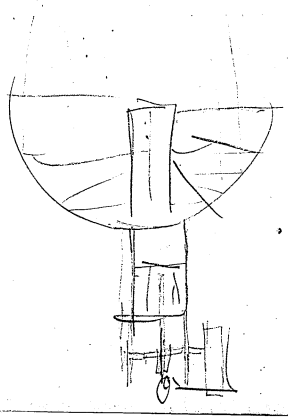
48 1/1500000

47 1/6500



E

Evaporation sur Table



136

4 | 144000 | 1 10/11
33 | 360 | 33
1440 | 33
2
33 | 1440 | 10/11
1
720 | 3 1616 | 3
3 | 945 48
3

9.45 39 m
80
720
440
608 3
115 20
8640
4 | 875520
33 | 218880 | 83
190000
19 8 5 5
33
200 | 2388 | 72
32

137

Porter Allen & Sons

Light Upright Engine

Cyl. 3 x 5
Stroke 3 in
1 in Pressure 80 lbs
Speed 600 Revs
Horse power
6 9/10 Brake h.p.
100 Revs 1 13/17 h.p.
200 " 2 2/17
300 " 3 15/17
400 " 5

15 25

16

Width Cylinder 6 9/16 Width of the piston
Height Cylinder 9 1/2 mm
6 9/12 Width valve
6 3/12 "
12 3/12
9 9/12
4 3/12
26 3/12
1 9/12 diam of crank shaft
6/12 diam of
7/12 diam
4 4/12
width of
diam
connecting

length of crank 5 3/12 whole stroke 10 2/12
width bodies of 1/2 8 length 5/12
outside diam of
Diam of valve rod 5/24
diameter
diameter
diameter
diameter
length of
diameter of
1/2 1/2 diam
1/2 1/2 of bolts
1/2 1/2

Eccentric collar 7/24

[illegible] collar 9/12

Middle fly wheel web 8/12

[illegible] 7 7/12

[illegible] shaft -

Middle of stroke [illegible]

" " 1 4/10 [illegible] -1

" " -1 8/12 dia from collar [illegible]

distance from [illegible]

Lower ring on collar 7/12

1 4/12

1 11/12

small rim inside of large rim

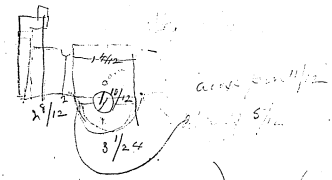
Distance between [illegible] 5/12 and [illegible]

for [illegible] 5 [illegible] Keys

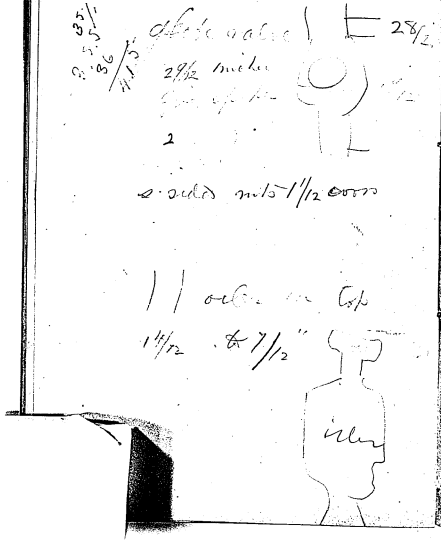
4 1/2 x 4 1/2

Rod holding [illegible] 5 1/12

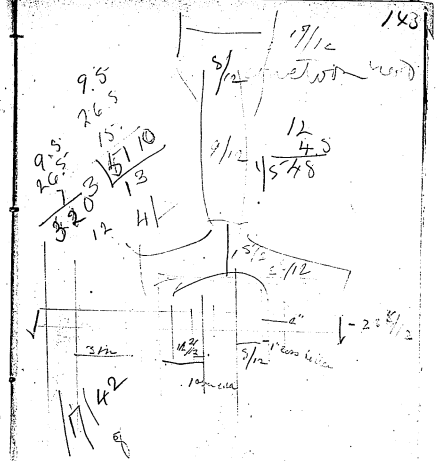
Cross head



142



143



1/5 of 1/2

3/2 × 1/5 = 3/10

9 1/2

4 1/5 +

19/2 × 1/5

1 1 9/10

1/5 of 6 6/10

66/10 ×

1/5

66/50

5 2/2

12

1 16/50

25

Piston Cylinder. at rim 6 0/10 — 1 16/30"
" " over wood 6 5/20 — 1 1/4"
Upper rim width 1 1/2 — 3/10
Upper " smallest width 3/4 — 3/12
Lower rim outside 1 1/2 — 3/10
ring inside Lower rim 3/8 from Top — 3/10
ring 3/2 wide — 9/60
Piston valve box — 1 7/16 6 4/12
Width of frame from cylinder 6 7/12 — 1 7/30
Widest bulge in frame 12 3/12 — 2 29/60
Narrow Waist bulge 9 13/12 — 1 29/30
Width of top - wheel 4 3/12 — 5-1/60
Rim of " 26 — 4 4/5
Diameter of crank shaft - 1 9/12 — 7/30
eccentric sheave - thickness 6/12 — 1/10 + 7/60
C° " " from shaft - 1 9/12 — 11/30 + 7/60
Rim of piston rod 7/12 - 7/60
Across cross head 4 4/12 2 6/30
Length from shoulder 2 8/12 — 8/15
Width at plate where piston rod is screwed in 1 4/12 — 4/15
Thickness across plate at pin 1 10/12 — 11/35

Clearance between crank rod fork & eye in 9/32

Width the throw-fork-of Cedar and crank 2"

Diameter of connecting rod pin 1 1/12

Length of crank 2 1/2 $\frac{BC}{10} = \frac{1}{2}$

Width of crank $\frac{1}{10}$

Diam of valve rod 7/16

Diam of the steam guard above 1 7/12

" " exhaust " 1 3/4

Eccentric collar 11/16

Fly wheel collar 9/12

Width fly-wheel arm 8/12

Length of spokes 7 7/12

Width spokes rim next 1 5/12

Width spokes rim end 1 5/12

Width the from arm 1 5/12

The fork collar 1 7/12 measured midstroke collar 1 1/2

$1\frac{1}{2}$

$\frac{D}{2} \times \frac{1}{5}$

$\frac{3}{10}$

$1\frac{3}{12}$

$\frac{5}{12} \times \frac{1}{5}$

$\frac{15}{60}$ $\frac{1}{4}$

$\frac{3}{12}$

$\frac{1}{5}$ of $\frac{1}{2}$ is $\frac{1}{10}$

$\frac{1}{5}$ of $\frac{1}{10} = \frac{1}{50}$

$\frac{1}{5}$ of $\frac{2}{10} = \frac{2}{50}$

$\frac{5}{8}$ of $\frac{3}{6}$

$\frac{66}{10} \times \frac{1}{15}$

$\frac{66}{50}$

$1\frac{16}{50}$

$6\frac{5}{10}$

$\frac{125}{20} \times \frac{1}{5}$ $\frac{3}{20}$

$\frac{1855}{1000}$

$1\frac{855}{1000}$

$1\frac{1}{4}$

$\frac{9}{12}$ $\frac{3}{4}$

$\frac{9}{60}$

$\frac{3}{8} \times \frac{9}{5}$

$\frac{1}{5}$ $\frac{2}{5}$ $\frac{3}{5}$ $\frac{4}{5}$ $\frac{5}{5}$ $\frac{6}{5}$ $\frac{7}{5}$ $\frac{8}{5}$

$+ 1\frac{1}{5}$ $1\frac{2}{5}$ $1\frac{3}{5}$ $1\frac{4}{5}$

$\frac{1}{12} = \frac{1}{60}$

$\frac{2}{12} = \frac{2}{60}$

$\frac{3}{12} = \frac{3}{60}$

$\frac{4}{12} = \frac{4}{60}$

$\frac{5}{12} = \frac{5}{60}$

$\frac{6}{12} = \frac{6}{60}$

$\frac{7}{12} = \frac{7}{60}$

$\frac{8}{12} = \frac{8}{60}$

$\frac{9}{12} = \frac{9}{60}$

$\frac{10}{12} = \frac{10}{60}$

$\frac{11}{12} = \frac{11}{60}$

$\frac{12}{12} = \frac{12}{60}$

$\frac{4}{5} + \frac{10}{60}$

$\frac{48+10}{60} = \frac{58}{60}$

$\frac{29}{30}$

$\frac{11}{1} \frac{1}{5}$

$\frac{2}{12} \frac{1}{6} = \frac{1}{5} + \frac{5}{60}$ $\frac{8}{30} \frac{4}{15}$

1 2 3 4 5 6 7 8 9 10 11

$\frac{1}{5} \frac{2}{5} \frac{3}{5} \frac{4}{5} \frac{5}{5} = 1 \frac{1}{5} \frac{2}{5} \frac{3}{5} \frac{4}{5} 1 \frac{1}{5} \frac{2}{5}$ 12

$11:2\frac{1}{5} \; 12 = 2\frac{1}{5}$ $\frac{1}{5} + \frac{10}{60} = \frac{2}{6}$

$\frac{4}{5} + \frac{4}{60} \; \frac{48}{60}$ $\frac{2}{5} + \frac{6}{60} \; \frac{22}{60}$

$\frac{1}{5} + \frac{9}{60}$ $\frac{24}{60} + \frac{20}{60} \; \frac{44}{60}$

$\frac{12+9}{60} = \frac{21}{60} \; \frac{4}{60}$ $\frac{12}{5} \; 2\frac{4}{5}$

$\frac{16}{307} \; 1\frac{1}{5} + \frac{4}{60}$ $\frac{17}{60} = \frac{16}{60}$

$= 1\frac{28}{60} = \frac{7}{15}$

$1\frac{1}{5} + \frac{2}{60}$ $\frac{1}{6} + \frac{10}{60}$

$1\frac{12}{60} + \frac{2}{60} = 1\frac{14}{60}$ $\frac{12+10}{60} = \frac{22}{60}$

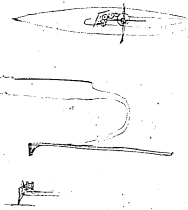
$1\frac{7}{30}$ $2\frac{2}{5} + \frac{5}{60}$

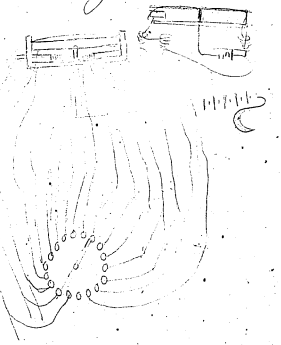
$\frac{24}{60} + \frac{5}{60} = \frac{29}{60}$

$2\frac{29}{60}$

$\frac{4}{5} \cdot \frac{5}{60}$ $\frac{48+5}{60} \; \frac{51}{60}$

Patien - For
Patent for
Engine Dwelling





x = 1 Dia

z = 2 Dia

c = 3 Dia

$x + z + c = 11$

$z = 2x$

$z \quad 2x$

$2x$

$2z = x$

$2c = x$

$2c + 297 = czx$

$2c - czx = -297$

$2c =$

$xzc = 0$

$xzc + 297 = czx$

$xzc - czx = 297$

$2z = x$

$x + z + c = 11$

$2z - c = 0$

$(x+z)(z+z)x(c+z) = 0 + z + x$

$x - x + z - z + c - c = -2 + 9 + 7$

$z = \frac{c-0}{2}$

156

157

x = manzanas

y = peras

c = bombillos

$x + y + c = 20$

$2c = x$

$c + y + x = 11$

$2c - x = 0$

$2y + xc = cy$

$xc - cy = 2y$

$c + y + x = 11$

$2c - x = 0$

$\frac{x}{3}$

$\frac{4x^2}{7} \div \frac{5x}{1}$

$\frac{4x^2}{7} = \frac{1}{5x} - \frac{4x^2}{35x}$ $\frac{4x}{3x}$

$\frac{x+1}{6} \div \frac{2x}{3}$

$\frac{x+1}{6} + \frac{3}{2x} = \frac{3x+3}{12x}$ $\frac{4x+1}{4x}$

$\frac{x}{x-1} \div \frac{x}{2}$

$\frac{x}{x-1} \times \frac{2}{x}$ $\frac{2x}{x^2-x}$ $\frac{2}{x-1}$

$4a^2b \quad -8a^2b$

$+11a^2b \quad -9a^2b$

$15a^2b \quad -17a^2b$

$-2a^2b$

$7abc^2 \quad -abc^2$

$+6abc^2 \quad -7abc^2$

$13abc \quad -8abc^2$

$16abc^2$

$-8abc^2$

$+9cb^3 \quad -8ac^2$

$+11cb^3 \quad +9ac^2 + 8ca$

$+9a-9a+cb^3$

$+ac^2 + 8ca$

$\frac{x-b}{8ca} \times \frac{4a}{3cx} \cdot \frac{xa-b}{6c^2x}$

$\frac{2}{}$

$\frac{x+1}{1} \times \frac{1-x^2}{a} \quad \frac{a}{1-x^2}$

$\frac{4x-1}{1-x} \times \frac{1+x}{1-x^2}$

$\frac{a}{}$

$\frac{ax(1+x)-x+1}{a}$

$1+\frac{ax(1+x)-1-x}{a}$

$\frac{1+x^2}{1-x^2} + \frac{1+x^2}{1+x^2} = \frac{2+x^4}{1-x^4}$

$\frac{1}{1+x} + \frac{-1}{1+x} = \frac{}{1+x}$

9

$6ac^2 - 5ab^2$
$+7ac^2 - 3ab^2 - 18ac^2$
$+18ab^2$

$13ac^2 \quad 10ab^2 - 1$
$-18ac^2$

Tin a b cube ans

$abc^2 - ab^2 + 5ac^2$.
$-9abc^2 + 6ab^2 - 8ac^2$

$-8abc^2 + 5^2abc^2 - 8ac^2$

$8a^2b^2 - 7a^2b + 5ab$
$-9a^2b^2 + 9a^3b + 8ab$

$-8a^2b^2 + 2a^3b + 8ab$

$3ab^4 - 7a^3c^2b^3 - 6a^4b^5 -$
$-8ab^4 + 6a^3c^2b^3 + 6a^4b^5 -$
$-6ab^4 \quad + 2a^4b^5 -$

$-6ab^4 - a^3c^2b^3$

11

$19\frac{1}{2}$

$2\overline{)39}$

6 1

$\frac{1}{2} + \frac{3}{4}$

$\frac{2}{4}$ $\frac{5}{4} \times \frac{1}{2}$

$\frac{5}{8}$ 2 $\frac{5}{8}$ $\frac{5}{8}$

$18\frac{10}{16}$

18
16
2

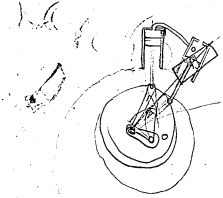
13
2 0 5
1 0
22
16

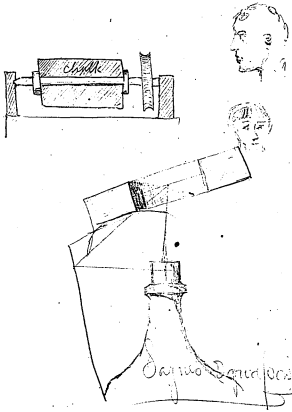
110
16
16 | 110
96
14

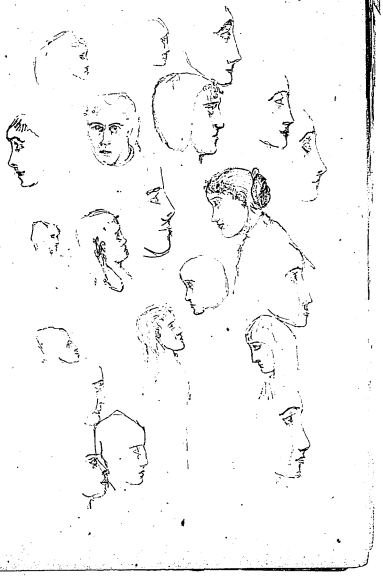
Chalk

Edison's Chalk Cylinders No 1

for 80 gr. chalk feed - 30 cu. centimetres of H_2 Each chalk weighs 1.33 gr.







Working Drawings for Lathe 35

Timber 3 x 4

fly wheel 2 ½ inches

height - 25.5 fly wheel

Length top 36 in Width 24 in

height 34 inches

34 - 2 = 32 / 4

36 - 25 = 11

178

179

Artistic attack Aug 30 1880

indifference

Cold

Practical

Sarcasm

Sentimental

Dec. 91. Bored

A. B. Merrick

Menlo Park N. J.

Gladstone

Gravity

Gravity

Stern & Tunnel

Inverness

London W.C.

I am the great I am

Unfaithfulness

Faithfulness

You must certainly of made a mistake on your answer to a correspondent on your own Thurs. day You said at the end of the answer that Yes ~~[illegible]~~ whether two horses over tied together a foot over the same or two four horses or one hanging to that

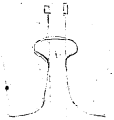
Yours A. B. Merrick

A. B. M.

A. B. Merrick

A. B. Merrick

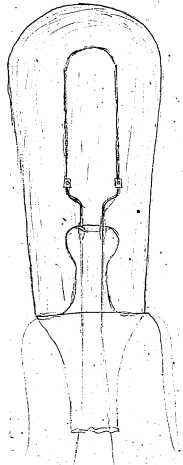
Allen

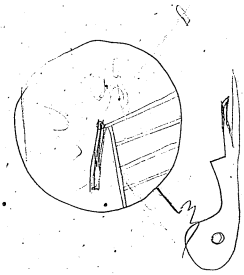


Ernest Bergmann

X — 140 / 76.07

2.146128
4.851289





have little tubes 1/16 of
and with apart- inside of work
a light elec magnet- which
are in series and as one
is magnetized it draws his tube
and changes the direction of
revolving pointer

Pituitary Gland

Conjunctival Conjunctival

192

180

2.62884
1.68124
3.18896

3. 130.968
14 132
130-21

4. 30963
130-21

301 3: 20400
78600 0435

4. 900913
0913
4.901 0643
2.638484
3.539.4933

.0435
638484
9486
33
5-3

4.634.483
4305
43605

194

195

50

52
5397938
5 3
8463D

680
90
61200

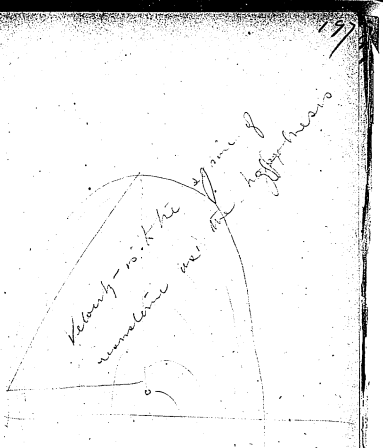
680
90

2.8921-09
1.95424 13
52.7562852

61147

61149

6325
6262
63


Velocity = 10.4 ft/sec
0

198

4746
742

3.675-412
2.870.404
6.545.816

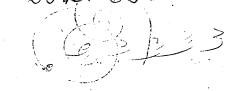
5.458.816
.5802
.14

3514
35-158
35142

5-925-
5816
109

5

4746
742
9492
18984
35221632



35-
6
R10

40/8960(99
360X
360
360X

12/150(12.50
12
30 02.00
24
6

James
July
Aug.
Sep
Oct-

61.00
54.74
8.56

57.74
15.00
1.00
1.00
54.74

James

7804
731

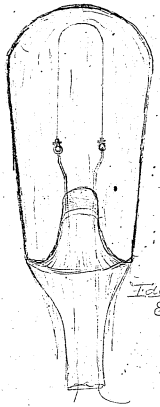
3.892317
2.863477
6.756284
.6150
1.54

5704477
E294
625-6
38

7804
731
7804
2841 2
5546 28
5704724

,51

21-4.50
12.50
1.50
1.50

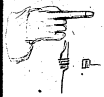


Edisons
Electric Lamp
Oct 12 1880

206

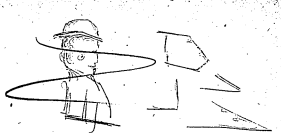
$\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$

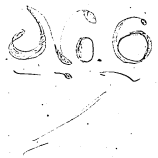
$\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$ Equal



Denver

Pat. by Edison July 23 1880
from this bottle





Mosby Henry Cary

6.9427 52
20
15
6.11
6.9427 1.846

136 / 76804 =

4.885361
2.135-89

4.885361
5-5-
5-65-7
4.885-103

4.885384
2.133589
2.755.1845

136 / 76804 (5-64
680
8840 3
816
824
604
40

401 / 39 8 Gal

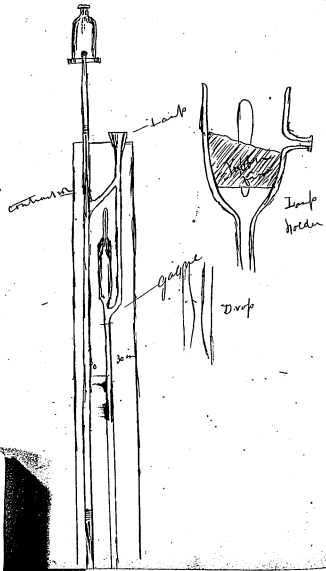
2. 60 31 44
4. 59 94 57

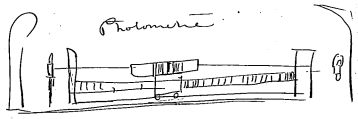
399446
11
599457

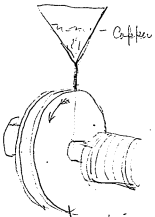
45 99 44 57

Del

June 2 1881 Notes to 608
to be presented in reference


Lamp
Lamp Holder
gauge
Drop
3cm


Photometer



Lead pieces recovering at sides. Few sec. and clump in the copper particles out of the ordinary path of projection

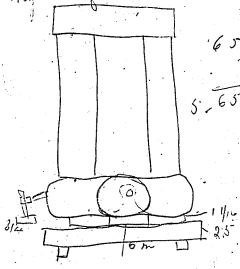
Bridle Fuels Magnets 53.7519
8574
54488

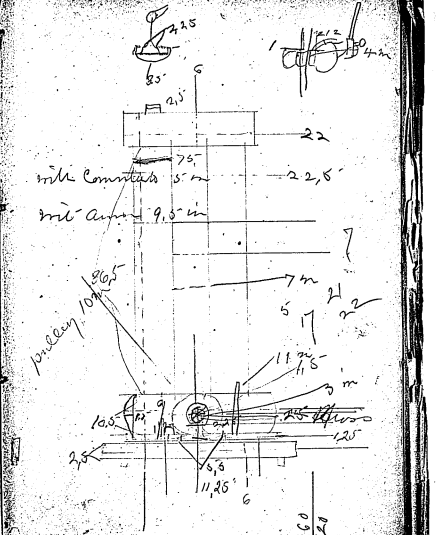
Total height

height of stand from ground

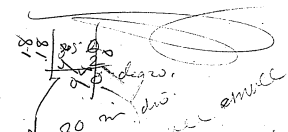
thigh of brace 03.37 x

65.5810
.17
9
5.65588.96




2,25
5,5
2,5
22
mit Contrepoids 5 m
22,5
mit aigue 9,5 m
7 m
Poulie 10 m
11,25
3 m
10,5
1,25
2,5
6
11,25
3860
120

Gal from scale 25 in
Indian scale 1.8 in


18
18
25
90 degrs.
30 m. dia.
Outer small gall
1.5 m. dia.
Rix
1.8 :: 25
1.5 m. dia.
170° Web
81 dry diff.
Web
Web
25
1.5
10 m. dia.
10 m. dia. in
25
1.5
25
1.8
25
1.8
25
1.8

$\frac{18}{10}$ Jobs -

$\frac{10}{18}$

10.8 Ohms are Cir

R Battery Gen 13

R D.C. 9

Indirect free molecular

Z ∇ I

$\mp = \frac{13 + 9 + \text{in}}{c}$ $\mp$ See Page 114

$c = \mp(13 + 9 + \text{in})$ $\Delta = 10$

= 100% Pow. $\frac{9}{10}$ 118 /

$\mathcal{R} = 18 = 5$ c/s Pow 118 Ohms

$\mp = \frac{100 + 8 + 10}{c}$

$\mp = \frac{100 + 8 + \sqrt{}}{c}$ Mf. 18°

$R = \frac{450}{48} - 100\% + 8\%$ $\frac{9}{18}$ 100%

279

$R = C(R + \Delta)$

$T + R\sin\theta = C(R + \Delta)$

90
6
720
4
2880

60° = 2880 chains

20° = 960 chains

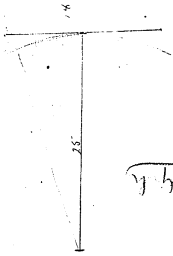
10° = 480 chains

40° = 1920 chains

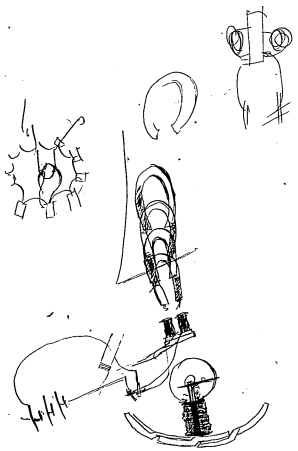
10.5 chains

Near Heron

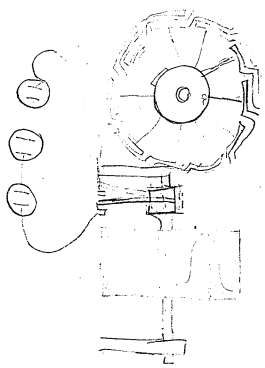
5. 65-5810
77
9.6
5. 655896



Glen Hawk Rd



2268



Bob Richard to Russell

A. B. Merrick

Walking

Walking

Washington Walking

Mary one son came

Saddle ON.p

Saddle

6.942752

20

1.5

.1

6.9427752

2345687

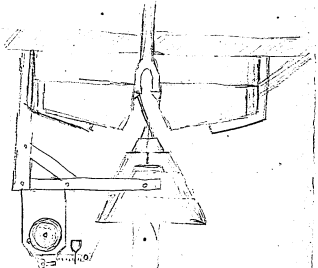
5.3702187

381

1.D

5.3702187

5.3702187



864201

5.936614 Log
90
.5
5.936619 Con

2. 5.38574 = 0.602660
1,740363
7.861797

1.88 123/876

0 1944.275 = .08333
.94384
1.14761

0.876143

1.091815

.005678

-5.936619 Log

2 of

Menlo Park Notebook #89 [N-80-02-06]

This notebook covers the period February-May 1880. Most of the entries are by Albert B. Herrick. There are also a few entries by other laboratory assistants. The book contains a record of experimental lamps burning at Menlo Park. The label on the front cover is marked "Record of Experimental Lamps." The book contains 282 numbered pages.

Blank pages not filmed: 154-273, 276-277, 280-281.

LIBRARY OF THE

BOARD OF PATENT CONTROL,

120 BROADWAY, NEW YORK.

GENERAL

_____, 189_.

605 Rec 870

Commenced running at 5.40

Broke Jet 3 minutes

Broke in Rotary clamps
Drilled on 603

604 Rec, 450

Commenced running at 7.40

Drilled on 6.55

Jet broke

Started 1.20 Pulling Pipe

Running

4/No 607 Rec 1870

O/No Custom Fiber with
Legation Fiber clamps commenced
8.20 PM.

Commenced burning 12.45—
Feb 6. to 1880

Burnt at 9.50

Burnt 8.15 Feb 7 to 8 AM

Burning Fired

608 Rec 8 05—

Commenced Burning on
Bucksteel Bench
Legation Fiber clamps

~~Commenced burning at~~
9.10 PM
4 B/No ~~Bucksteel~~

Burnt 8 + 22 + 4
29 hours to latest burn
Longest fiber lamps. —

6

Eng. of the Trouble
Syginum Fibra Clamps
Condemned with fever
B.B. 2 o'clock PM. Much on pumps

to 626 experimental

Res. 267 in steel lamp stand
on long tables in Lab. Feb 10 1880

Commenced 2.15 PM
Burning at -

Clamps wide apart glass between leading wires Syginum Fibra Clamps

12 inch fibre round - about
[illegible] fibre broken at - pages 5 -

7

627 Rev. Stand & Clamp for posts—
Bottle 20 drams nec. commenced
Rev. 320 burning at—
Inside glove glazed platinum
Mica inside apeal— 9.50 F.M.
Bursted at— 10.22 by accident—
Glove broken Clamp gas— heated

634
Rev. 240 commenced burning
at— 10.12
Bottle Rev coils
Bursted at— Pre.

Bench

to 635

Res 385

Commenced timing at Res. coils

Feb 10 1880

— 10.2 —

Gave out 7½ hours

Glass broke as a result of bad clamping.

12

636 for stand on Sub. Table Cap

Ps. 418

Commenced 1 Feb. 11 1880. 9 A.M.

Running at- { 415 — Rev.

√ Braided Fiber

at- 91.0 Total knots

6 Clamps lost- Tensile broke

636 for stand on Lab. Table Comp

Rev. 418

Commenced Feb. 11 1880. 9 A.M.

Running at- { 415 — Rem.

√ Braced Fibre

at- 91.00 Total Issue

Clamp Nut- Issue note

635 On stand in Long Pasture

Res. 342

Commenced Running at Buster

Feb. 12 1880

4:15 P. M.

Carbon Sealed 10 in 2

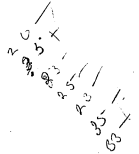
Bimlea Fibers

Clamp ~~Left~~ ~~Pasture~~ cause broke

Broke 1/4 inch above clamp

16

638 No Rec given
Rec. .001 fiber
Rec. Gave Forke [illegible]
total Casing given [illegible]



639 No Rec given
.001 fiber
Rec
Rec. on tubes Tested Rec
9,10 P.M. (Hammers Trouble)
Busted
in 8 minutes time
fibers Forke Casing comp
Clamps No Leaks
Tubes Rec on pumps and run
Stand 30 min.

680 On table on Laboratory

Rec 2 2 2

Commenced running at Feb 13 1880 4.00

Cocoa Mud - Champ

Immersion Tube

~~Emb~~ one 2.503

687 On table in Laboratory.

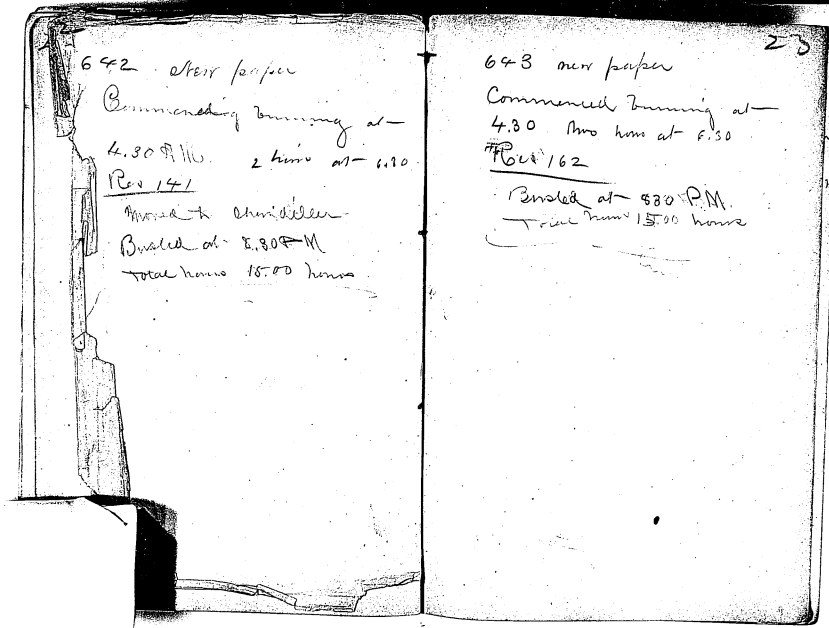
Res Manilla Jr

Commenced running at Feb. 13 1880 4.00 P.M.

Broken at 6.20 Total time 2 hrs. 20 min. 2.20

Went on the positive side

6.89 Qm long table on laboratory
Res. 800 P permanent – commit
7.15 – Feb 12
Lower Unit Line
Cross Unit Line
Private at ½ Quantum
Large figure No. 689
Price



642 Street sweeper

Commenced Running at—

4.30 P.M. 2 hours at 1.10

Roll 141

Moved to Christadler

Braked at 8.30 P.M

Total hours 15.00 hours

643 Street sweeper

Commenced Running at—

4.30 Two hours at 8.30

Roll 162

Braked at 830 P.M.

Total hours 15.00 hours

2X

645 Hungry Hill and Leading mines

Res. 137

25 ohms res. in series

2.50 Fr. 11.

Nothing in track

Small-Howitzer regulator

12

12.50
2.50
9.10
5.00
14.00
5.00
19.30

Small Howitzer 14

Large " 48

Large " 16 Large Howitzer

Parallel Cartons at pos. 3

Small Cartons

640 Hungry Hill and Leading mines 2X

Res. 215

With 20 ohms res. German silver wire

Commenced running at 2,45 am

Cocoa Mill - Clamps

" " Fiber

14.00

10.00 hours

Clamps broke one in clamps

see effect on platinum wire

6446 Coconut fiber

Run 79 Commenced burning

at- 4.15- 7.10

Coco. fiber Cocoa Clamps

3 hours total time burned

broke at the clamp had place

6454 Carbon rod

at- clamps

before burning

28

646
Reo 379 Broke at —
Camps no named
Broken to get — Camps
Jobes —

653 — 654 Put up ammo
600 shots badly assigned in about
hour up to see how long burned
not counted Feb 16 1880
65-4 Brig Corps trucks
22
22
22
22
69 Shots Burned
seemed to get — brighter all
the time omitted Jobes get Jobes
3
653 Burned at —
total hours 280
Feb 27, 1880 at 8 P.M.

30

657 on hand-books on 31
Res. 25-0 long table 5.40 PM
To be timed every 30 min
13/1000 paper small books
High res.
Time timed from on 5-40
6.10+
6.40+
7.10+
7.40+
Burned at 10.55 8.10+
Stopped Burn. 8.20
tin foil got crossed 8.50+
Burned 5.15 — time 9.20+
hours 9.50+
10.20+
70.50

32

652 Jn Chandelier 33

by organ. smith order.

Commenced burning at— 6.20 PM

Drizzle torpo

Cal-fum. 13/1000 parker

high. Bar. 270

Taken from Chum. and

fowl-over Churchis Bench

118 hours.

Broken at- portion

between clamp and anode

8X

496 Dr. Jno. Batchelder
Bench
Rec'd 130 Double Cushion
one Leaver for exts.
~~9.45~~
11.25

35

470 On Batchelors Bench J6

Rev. 130

Diuvill carbon

Commenced burning at 11.15 Feb. 13 1880

Taken out of Batchelors Bench and put in chamber by again turning during 30 minutes

11,20
11,50
12.20

Bristled in 4½ hours:

carbon broke out — Pos 4.

56

4/2 On Rubbing table on Hand 3

Camp
Rec. 442
Commenced
turning at-

Feb. 13. 1850
11.20 PM

to be trimmed every 30 minutes
Small Carbon rod secured for
exp.

11.20
11 50 "
12.20 "
12 50
12.25 2, 30 = Total

Looked as if Top corner
had snapped off.

38

491 over Pomeiss Bench 39

Res. 160

Commenced

Finished over as

40

6-9 Res. 13- 27

Longé Gelée ordre entrée

Biscuit — 6 hommes en sol:

Bretel en Dimanche à 1- 6.s.

Biscuit à 1-/3. 12

Droit Kaour ordre hommes

Q2

Jim Preston Principal Player

690 Donald Canton in 6½ Hours

Rec 160.

Commenced running at 2.00 P.M.

Bowled at 9.00 P.M.

9.00 hours Total.

6685 points were scored

Gales Limited Donald Canton

Rec. 175 Donald Canton

Reserve Champion

Commenced running at 2.00 P.M.

8.48 Bowled

6.45 Total

D2

66 g Arnold & carbon 1 soaked over
Completion from 6 1/2 Trans
Res. 160 Com. burning at - 200
Burned at - 6.30.
4.80 Total Burning time.

Tot. 171 $00

671 Arnold Carbon on Line on
Res. 938 Long tubes
com burning at -
4.25 - PM
Developed in oxygen glossy pressed
paper
Burned at - 8.45 -
Carbon Blocked at - 1200 V
Arnold 4.20 Trans

46

672 Diesel Cartoon on Foreign Tube

Rev 81 Commenced burning at 4.25

Started in engine

Buried in pos 5

Buried at [illegible]

Total time burned

4.35 Total time

673 Diesel Cartoon commenced burning

Rev 80 at 4.25

same as 672 time and

page

Buried at 9.00 PM

Total time 4.35

676 Exp. post-on Table at 12 midnight — Feb 18 1880
Pos. 70 Engaged after-cutting X

12 24
12 12 45
37.45

676 | 22.
76

42 hours Total - up to 8 P.M. Feb - 26. 1880
Nil.

679 Put on table at - midnight
Feb. 1880 Longer Girls
Pos 60 Third wat -
Same rd Dr 676
Started at about 12 mid night
Left-over
Total hours 24 hours

37.00
7.50
29.10

676 Post-oak table at midnight
Feb. 18 1860.
Clear 61 above
Done 60 6760 P.

42 Hours Total - up to 8 P.M.
Feb-20-1860.-

Finished at 5 o'clock P.M.
Total hours 118 hours total

681 Post-oak table at
25 [illegible] 1818 1860

Double loop auger
coated Carbonized tenon
middle pedates
Post-oak bench

1 @ 7.50
4.10
1.00
12 @ 2.10
1.40
37.45
681

44 Hours Total Feb 20 - 750 P. M.

52

6 pc on table R 79

Commenced hunting
at 3.40 P.M. Feb 29 1880

Result Organised before
collegate church together
see 13.0 book

Bristol on pen. 1
Bristol at 6.00
2.20

685 over table ordure out 53
paper 4.55 A.M. Feb 29 1880
Commenced hunting
Bunch of runner peas
Bristol on pen 12
11.30
4.30 P.M. 95.0
12.00
4.55
7.05

11.25

J-4

Feb 20 1850

684 over cotton Tassels

commenced to grind at

Branch of Jute Fiber

Rev 290 5.25 A.M.

Total 14 Hours at 8.25 Feb 20-1850-

684 Rev 103.

Small Jute Factory

Commenced butting at

5.35 Feb 20. 1850

on two tables by 2 persons

682

Total 14 Hours at 8.25 Feb 20-1850.-

Buseld at 9.00

Total hours 14.40 mins

56

689 On heading mine

Large bunch fine jute

Back cinders it- broach

root

11.37 Fdk

Glass Plates

don't know time

4.30

8.20 total running time

688 on heading mine

Bunch of jute fibre

Carbons here Back after to

all over

11.50 Fdk Fdk 30 CB

Busted at Clamp

~~Don't know time~~

8.30 taken

8.20 total hours worked

68 3, on Loading mine on Rec
Small torpedo
3.00 P.M. Feb. 20 1880

Total Horses burning 5 - at 8 P.M.
- Feb 20 - 1880 -

6807 On loading mine
Commenced burning at 2.00 P.M.
Feb. 20. 1880

Total No. Horses 4 - at 8 P.M.
120 Tons. March 11, 1880 Feb 20 - 1880

Carbon hoisted at
dumps mine No. 120 tons

60

700 On leading wires by
2 chandeliers large bulbs
Commenced burning at- 4.50 PM
Feb. 20 1880

Res. 147 Large Edison

— — .010 in Brushes worked
in wrong set of carbon before cutting

Total 16 Hours 4- at- 8 P.M. —
Feb 20- 1880-

On Shelf —
Moved to Mr Batchelors
Bench. March 11 1880.
Taken

701 Res. 148

Brushes by John
Feb. 20 1880

61

62

696 12 40 PM Feb 20 1880

Rec 136 on Long Table

Moved to Reg book Page 79 #

Page B550 filed

now in charge by recipient

Burned March 2 1885

63

Page 35 Reg [illegible]

702 Bond heading Orizaba between 1 & 2

Chem Rec 190 Com. Running at Feb 21 at

P 2.30 P.M.

B Brickell & after burning 2 1/2 hrs

64 15 Jn Chem Third Junior
Reger
com Jimmy Feb 23 8:00 Am
Reg. sugarcell
Jn Reg took Page 75

713 Jn chem 7y agnes antonelli
Feb 23 8:00 Am Jimmy
Reg. sugarcell had dyer
in custody
Jn Reg took Page 71

64

705 on mines between 1 & 2 chains.
Feb 21 — 230 P.M. com. by mud
Bass fishers. Geo. 225

March over Minnesota Territory

Feb 23 | 1880 | Mch 7 | 9½ 176 154 339½ 317½

Had [illegible] March 7 — 12 midnight 317½ hours

220 537 317 582

23 12 11 220 11

March 25 — 1880 110

March 29. 640 1164 208 2148 2

Mch 17 1880 Angled Cinton
at foot S. Flat Agency

17 14 76 1 266

68

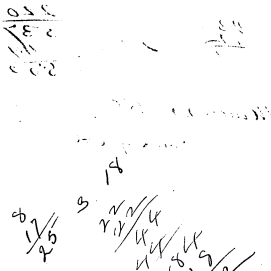
704 on leading corner between 1 & 2 chans.

Res. 400

Perm beginning at Feb 22. 2.30 P.M.

Bass filter 5X .014

Same as 705



69

702. on Mics between 1 & 2 chans. 3 stems

Res. 190 Perm beginning at 2.30 P.M. Feb 24/80

Bass filter 5X .014

Moved over' mng desk

Feb. 25 1980

Moved one cubic foot

3 inches

70

707 over Carbon table Jan Class
Westonis commenced running at—
Feb. 22 7 o'cl P.M. 1880 Reo 142
Reg custom engraved
March 4 burned carbon
Ended at pos. 8 at 7.00 P.M.
Total time 281 hrs 00 min
Returned

706. Over Pass. Clerks table Operation

Reo 141
Ran running Feb. 22 7.00 PM 1880
Reg. custom engraved
Carbon broke out - between Pos.
1 and 8 time — 8.00
Total hours 8 — 15 2 — 26 — 26
Burned at 9.00 A.M. Feb 2
Total run running — 8.00
" " 45 hours

71

72

724 Brevet Battalion Bench

Rev 125 Feb. 24. 1880

Large Troops entrenchment

.010 prepared in

Standard Rule.

180 March 24/1880

722 Iron Chamber dry region 73

Rev 97

Bricks at Rest 8 in about

8 hours

Large Loop entrenchment .010

rapidly Prepared in Standard

and entrenched.

74. 729 Mer Microscope Tubes
on order.
Rec'd 160 pieces ends cracked
in transit engaged
Smalley ~~Eng Co~~
carbon tube at piece ends —
~~from~~

739 or Long Tables Mons.
Rec 144
Com. Running at —
9,15 — Feb 26. 1880
Reg. engaged
Glass mettle Rubb —

76

78-6 on Rhode Island
carbon brike ad- position 6 77

Burnt on Saturday Feb 27, 1880
about 22 hours Req Engineer
Rev. 130 Jacobs

78

762 on Second Chronometer from again

Res. 172

Com - b. found March 2 1880 at - 5.30 AM.

Reg. carbon standard sol. Bad spots in the Carbon

Mounted at 2nd spot - after trimming 7 hours

761 on Liverpool made Chron from again

Res. 203

Com. running at - March 2 1880 5.30 AM.

Reg. carbon Standard sol.

Fusion soft - very bright

13

79

80

742 On Chain by pmm 2
Res. 190
Comd. burning at Manch. 2/1880
5.30 PM.

Large Loop Standard Sol.

Taken down stairs to test
Brought ups and put over
Mr. Batchelors Bench

Marked + Reg Book

774 On Long Table. Inp. Stairs St Lab.
Res. 207
Large full glass
Comd to burn. March 2 1880
at 3.30 PM.

82

773 Ore. Lab. table 83

Reg. 705. Lange bulb. glass

Penn. Training at 2 March 1880

3.00 P.M.

Changed to Reg book

84 Exp.

808 Open Cuban Table
Impeban Res 6.900
March 6. 1880 7 P.M.
Blowed at - platinum wire
fused and glassed sealed
Burnt about 8 min.
one fifteen of fuse with copper ends

808 Jr Chim Thimble from
organ Res. 195
Put up at March 6 1880
Large Exp 24 Inches out -
and fuses together
Blowed at 9.00 total time -
28 time none parted

83

790 Ct head Sisters in Chas 87
Contended
Res.
March 3 1880

Charlie gone to the Star
Broke 18 in sheets Irons
Pressed before cutting
Carbon to 89 Lay Loop
~~Handed~~ gone
13 Inch Wide 2/+

58

709 one carbon Tantalum disc
Res. 187
Small carbon .015 - paper
March 6 10 P.M. 1900.

Burner 20 mm Bunsen
9 Cross Wound

792 Other Inn Butchelbach
Bench
Res. 197
Com 2 Inn { Inn 7
at 6.00 P.M

Busted at position 2
Total hits 10

827 Dr Edward Thurn 93
from organ
Rec. 87
Corp. A. Comm Branch 18 1880
0.80 H.M.
Small drop .015 Soaked in
Sulphate of ammonia pressed
To .007 (compressed) at end of
Carbon
hrs 3mm = 11 hrs

8 29 Pierson chimes
from organ
Rec. 85-
Com. to time March 10 1880
G.H.M.

Small toppo .115- Paper backed
in sulphate of ammonia pressed
to .007 approved
Brates
hms 12 hms ~~thumb~~ thumb 1892
Brates at position 3

96

97

1836 Mr Shaw by organ
north side
Rev. 13 mo 1st Thirty minutes
Mamillon Fibers ends cupped
plated
Interior drum Illinois

98

8 32 Pro. Bunker took 99
839 / March 12 1880

825 Woods stains in Photomicr.
Rooms Exp Pro Roland
K198
Broken off at clamps —
Palmetto Leaf 138
Copper plated

834 Woods stains Exp.
Pro Roland Glass broke
Res. 198
Mammillea fiber .007 stain —
Copper

857 Small loops soaked in
Res. 280 before staining
stain pressed Rm 154.
Copper

All above samples run
down stairs showing the
experiment March 11 12 / 1880
Mrs. exact running time
as not known. did not touch up Oct. 14

102

856 Jn Francis room 103
Rec. 50 March 24/1850
Burnt – 2 Rms taken with
a report –
Palmetto leaf supposed very
poor pass

528 E+P. Lamp did not burn
Low Res. 87 March 15 1880
Paraine heated at pos. 6

Small losses .015 Paper soaked
in sulphate ammonia pressed
to .007 supposed

831 ♂ ♀ p. Lathrop March 14 1850
Res 84
Bonated Types. 6
March 15/1850

Small Loops. .015 paper
Soaked in sulphate of ammonia
pressed to .007 dispersed

811 Exp. Lamps Month 14 1885 109

Ref-to

Manilla Fiber ends copper-
plated Carbon exp 122

110

848 Ord. p. Stamps March 14 1889

Res. 44

Palmetto Leaf Appeared

830 Small Loop .015 paper 13
baked in ammonia and pressed
& .007 copper
R=0.8 March 14 1860

114

872. March 14 1840 113

Rec. 85

Small Leaf soaked in sulphate
& ammonia & pressed

116

826 Mrs grass custom 127 117
Res 98 Copper-plated very brittle
March 14 1850

827 Lucille Lodge Dist - page 119

Res. 87

Ordered in substance of amount passed 4.1.07

869 Small soap g.o.s soaked
in sulp Ether of ammon pressed
worked at ten hours on pumps
could not get high Vacuo

870 March 14 1850 123

Rec. 97

Double doses of 0.05 dissolved in sulphate of ammonia passed on pumps can have not high fevers

8-29 Braked on Bulkhead at 120
Rec. 85 — comma passed and [illegible]
copied

124

924 Civil Papers Intl Vol 2

Rec'd 29 March 18 1880

Mummulla fiber carbon 1.62

Copperas Com. 6m 3.80

Bristol ft 10 m 7 8/10

Very bright dyer - for dumps
also a dimpled bright
dyer other for the, at pro 6

430 m Total hums turned.

Mistaken for 921

Civil turning 13

24.
18
18
13
45
15
195

128

129

9.2.1 Abra paper inoculum
Res. 498 March 18 1920
Mimulus fibers Car. 160
3.30 P.M. coppered

Bristol at Res. 4 1.40 hours
60

130

918 Over my Block 131

Res 750 —

Cor. to Bruin | March 18. 1880

8.45 P.M.

Selected Mamilla fisher centon 162

925. Over proper tubes
Res. 450
Com. 6mm

March 18 1850.
8.45 P.M.

Thimble Tube carbon 162

3.05 PM Bursted glass opened

6.20 Total time burned

920 by Mrs. Parker

Res 475

Committee March 18 1880

9.55 — 10.20 : 25 minutes

Selected Brunelle Parker

Can 162

~~Lind L.~~ Grand Trunk

136

9/2 on table two more 137
Red 500
10.25 — P.M.
Total crush glass broke to piece
nothing left except bulb
Selected Manilla High Ra
carbonized Total 4 hours

138

Taken by Pro Bracket 139
March 19 1880 5.5-3#

140

953 Exp Lamp

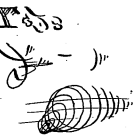
1 Build n: glass Bulb

immediately 1 Mount 28 1880

Michel exhib

Small Loop Inductive

Loc proved .815 — ϕ 007



141

Gfld. Given to the Harold of

U V Time Service

Sugano

Small loop Inductance Std

-815 Proved .007.

14296 on Irons over table

March 29 1880

Glass Broke after burning

coal 8.30

Rec. 3 1/4

9253 on Irons over table

March 29 1880

glass broke Tobacco burning

6.38.30

Rec 336

962 on axis over table

Res 229

March 29 1880

Carbon broke at No. 9

972 on axis over table

Res 720

Com burning 8.30

Juice burning two hours

1.30

3.30

10.30 30 March 5th hour

146

Lus.

887. over Table on mins

Res 251

March 29 8.30 P.M.

still burning

975 On Table 30 mins

R 130

Incandescent

March 30, 1880

Con. To burn at 8.30

147

14 ft Ground glass one of Arclights
arm & burner Apec. 3 1886
over. carbon failing 7 5 5
10
15

Mon Evening
April 3rd 11 15 Voltage
7 days @ 13
7
91 hours total 91
carbon broke on Saturday Apec. 368
very bright part time

a lamp mounted on Tuesday evening
arm burning Apec. 10 1886
R 442. at 10 Amp.
arm mounted of Lab. on morning
mid
10 candles power
high vacuum

110

993 on two wires on table
Rec 740 Bijou Incandescent lamps burnt 10 minutes
Manilla fibre. clamps
4 candle power
a/22 10 1880
high Vacuum.

991 Rec 420
Manilla fibre 8 candle power
on two wires over table
com. burning a/22. 10.1880
10. am. long glass
high vacuum.

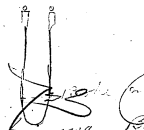
111

152

1079 Ore. main line
Rec.
Wood
Com. Running May 13 1880
10.30 ~~am~~
Wood carbon cut by
Chas. Heath on cam marking
This was ~~2~~ one of first three
cut—

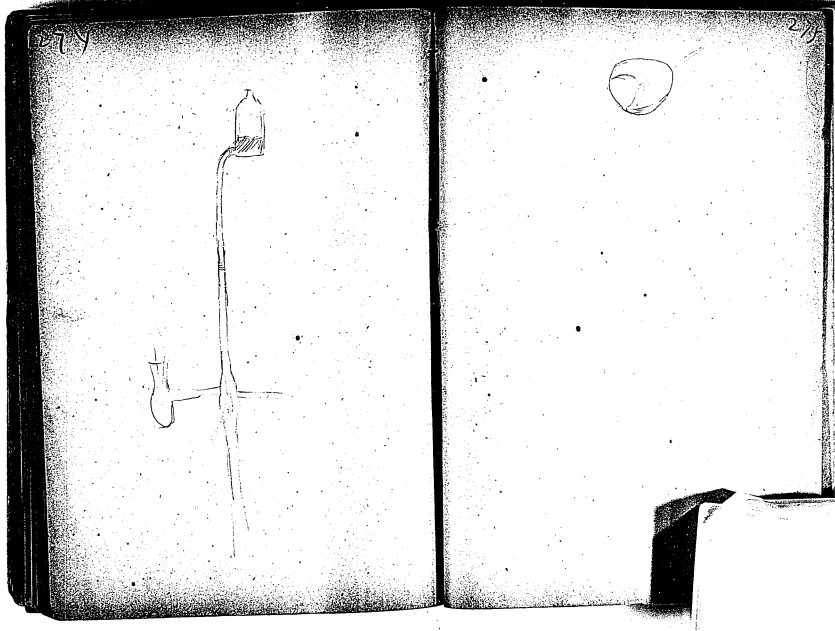
Record of Lamps
No 73

1080 Ore. main rivers
Rec.
Com. Running May 13 1880
10.30 A. M.
Wood carbon cut by Chas
Heath on cam marking
This was one of first three
cut—



Running

When running enter on railroad
Total Time 5 hours



Drawing No.	Catch	600		650		700			
603	1	644	27	689	56	778	86	870	125
605	2	645	28	688	57	808	84	829	125
604	3	653	29	693	58	880	85	924	127
607	4	654	29	697	59	790	87	921	129
608	5	657	31	700	60	789	89	918	131
609	6	652	33	701	61	792	91	925	133
626	7	490	36	696	62	827	93	920	135
627	8	492	37	702	63	829	95	912	137
634	9	491	38	715	64	836	97		
633	11	659	41	713	65	832	99		
636	13	670	42	703	67	834	99		
635	15	668	43	704	68	825	101		
638	16	669	44	702	69	834	101		
639	17	671	45	707	70	857	101		
630	18	672	46	706	71	856	103		
637	19	673	47	724	72	828	105		
639	21	676	48	722	73	831	107		
642	22	679	49	727	74	811	109		
643	28	678	50	739	75	843	111		
645	24	681	51	738	77	830	113		
640	25	675	52	762	78	872	115		
646	26	684	53	761	79	826	117		
		682	54	742	80	827	119		
		674	55	774	81	869	121		

82

47 : 402 :: 8 : x

47/3216 (8

47/3216 (8

47/2682

x = 400 × 400

x = 3216

x − x = 2682

g = 306 × 4

g = 1224

g + x = 1224 + 1600

1600

4400

1224

Thomas A Edison

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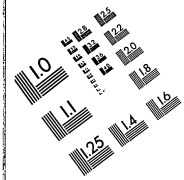

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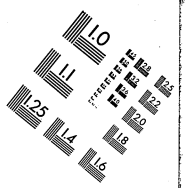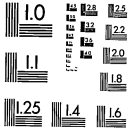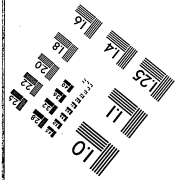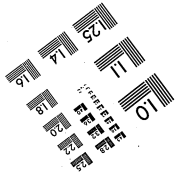
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